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SAMPLING EVENT REPORT NUMBER 17 ELECTROFISHING FOR FISHERIES INVESTIGATION AT SELECTED WATER BODIES NAS JACKSONVILLE FL

7/1/1993

ABB ENVIRONMENTAL

SAMPLING EVENT REPORT NUMBER 17

ELECTROFISHING
FISHERIES INVESTIGATION AT SELECTED WATER BODIES

NAVAL AIR STATION
JACKSONVILLE, FLORIDA

Contract Task Order No. 075

Contract No. N62467-89-D-0317

Prepared by:

ABB Environmental Services, Inc.
2590 Executive Center Circle, East
Tallahassee, Florida 32301

Prepared for:

Department of the Navy, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29418

Joel Murphy, Engineer-in-Charge

July 1993

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GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
ARARs	Applicable or Relevant and Appropriate Requirements
AWQC	Ambient Water Quality Criteria
CH2M Hill	CH2M Hill Laboratories
CLP	Contract Laboratory Program
CRDLs	contract required detection limits
CWA	Clean Water Act
DDD	dichlorophenyl dichloroethane
DDE	dichlorophenyl dichloroethene
DDT	dichlorophenyl trichloroethane
DQO	data quality objective
°C	degrees Celsius
ECT	Environmental Consulting and Technology, Inc.
EIC	Engineer-in-Charge
ER-L	Effects Range Low
FSWCS	Florida Surface Water Classification Standards
HES	Heartland Environmental Services, Inc.
IDL	instrument detection limit
kg	kilogram
MCL	maximum contaminant levels
MCLG	maximum contaminant level goals
mg/kg	milligrams per kilogram
µg	microgram
µg/ℓ	micrograms per liter
µg/kg	micrograms per kilogram
µmhos/cm	micromhos per centimeter
NAS	Naval Air Station
NEESA	Naval Energy and Environmental Support Activity
NOAA	National Oceanic and Atmospheric Administration
OU	operable unit
PCBs	polychlorinated biphenyls
POA	Plan of Action
PSC	potential sources of contamination
QA/QC	Quality Assurance and Quality Control
SAP	Sampling and Analysis Plan
SOUTHNAV-FACENGCOM	Southern Division, Naval Facilities Engineering Command
SUs	standard units
SVOCs	semivolatile organic compounds
TAL	Target Analyte List
TCL	Target Compound List
TICs	tentatively identified compounds
USEPA	U.S. Environmental Protection Agency
VOCs	volatile organic compounds

1.0 INTRODUCTION, PURPOSE, AND SCOPE

ABB Environmental Services, Inc. (ABB-ES), under contract to the Department of Navy, is submitting this Sampling Event Report for a Fisheries Investigation at Naval Air Station (NAS) Jacksonville, Jacksonville, Florida. The investigation was conducted at three separate surface water bodies located at the facility. The surface water bodies included: Lake Casa Linda, Lake Scotlis, and the Polishing Pond. Lake Casa Linda, which also is known as potential source of contamination (PSC) 21, and Lake Scotlis are both located within the boundaries of the on-base golf course. The Polishing Pond (PSC 42), which previously was the last stage of a wastewater treatment plant prior to wastes discharging to the St. Johns River, is located northeast of the wastewater treatment plant in the northeast part of the facility (Figure 1-1).

This Sampling Event Report summarizes the methods used to conduct the investigation, summarizes the results of the field investigation, transmits the field and analytical data, and presents the findings of the fisheries investigation for the three surface water bodies.

The purpose of the investigation was to assess the potential or actual contamination of surface water, sediments, and biota at each of the surface water bodies and to report any constituent concentrations that are greater than standards or guidelines established by the Federal ambient water quality criteria or Florida surface water classification standards.

The multimedia sampling investigation at NAS Jacksonville consisted of three components conducted on each of the three surface water bodies:

- recover biota samples by electroshocking methods for laboratory analysis,
- collect surface water and sediment samples at three locations within each surface water body for laboratory analysis, and
- measure surface water quality parameters for each of the surface water bodies during the field investigation.

Fieldwork for this sampling event was completed during February 2, 1993, through February 8, 1993.

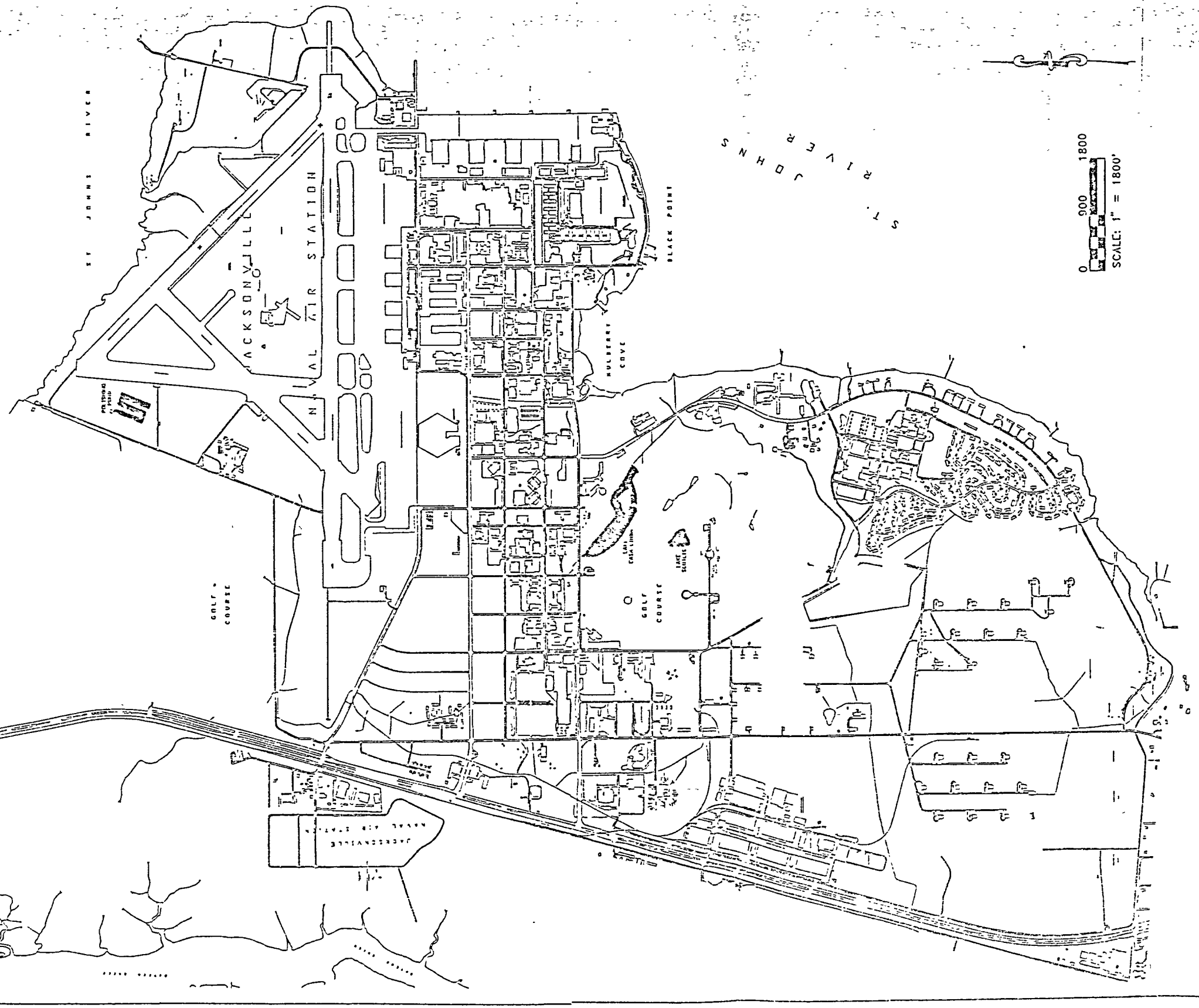

FIGURE 1-1
SITE LOCATIONS MAP

FISHERIES INVESTIGATION
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2.0 SAMPLING APPROACH AND FIELD CHANGES

The work described herein was performed as presented in the Sampling and Analysis Plan (SAP) included in Appendix A. Based on discussions between the Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) Engineer-in-Charge (EIC) and the ABB-ES Project Manager on May 14, 1993, an addendum to the SAP was completed. The addendum modified the requirements for the Sampling Event Report deliverables. The SAP addendum is included with the original SAP in Appendix A. Any exceptions or deviations to the original SAP or the SAP addendum are described in this section.

A total of 12 biota samples were collected by electroshocking methods from three separate trophic levels within Lake Casa Linda and Lake Scotlis. Electroshocking was successful in yielding biota samples at both Lake Casa Linda and Lake Scotlis; however, no biota samples were recovered from the Polishing Pond. Although extensive collection techniques including electroshocking and netting were attempted at the Polishing Pond, no fish were observed or collected. It is extremely unusual for a water body that has existed for a long time to have no fish species of any sort. The Polishing Pond supports some vegetation and provides habitat for birds and mammals that are associated closely with the water body. In addition, entirely aquatic invertebrates (e.g., creeping waterbug ambrysus femoratus) were observed in the lagoon. Additional conclusions regarding the absence of a fishery in this surface water body are outside the scope of work and can not be made at this time.

Table 2-1 presents a summary of the trophic levels, species collected, size of species, and the sample designations assigned to the biota samples collected in Lake Scotlis and Lake Casa Linda. The electroshocking investigation was conducted by the subcontractor Environmental Consulting and Technology, Inc. (ECT) of Tampa, Florida. A report of their activities is included in Appendix B.

The SAP called for the collection of nine composite samples from the trophic levels including: three omnivorous species, three piscivorous species, and three herbivorous species. However, collection of biota sample was limited by the actual fish species and fish sizes encountered in the individual surface water bodies. Separate age and size groups were collected from each of the three trophic levels at Lake Casa Linda, whereas only separate age and size groups for the omnivorous and piscivorous trophic levels were identified in Lake Scotlis. Only one age and size group for the herbivorous trophic level was collected at Lake Scotlis.

Each biota sample consisted of several individual whole fish within a single species and size group. Following sample collection, the fish samples were immediately hard frozen on "dry" ice and placed in zip-lock bags. The samples were then placed on "wet" ice in shipping coolers and shipped via overnight carrier to CH2M Hill Laboratories (CH2M Hill) in Montgomery, Alabama. Upon arrival at the laboratory, the multiple fish in each individual sample were dissected into two separate sample portions for laboratory analysis. One sample portion consisted of fillets and the second portion contained liver and gonads.

After several fish samples had been dissected in the above manner, it was determined that the fish did not contain enough liver and gonads for a separate laboratory analysis. Therefore, whole fish carcasses without the fillet portion were analyzed instead of the designated liver and gonad samples. Three of the

Table 2-1
Trophic Level and Biota Sample Summary Table

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Surface Water Body	Trophic Level		
	Herbivorous Species, (Size), and Sample No.	Omnivorous Species, (Size), and Sample No.	Piscivorous Species, (Size), and Sample No.
Lake Casa Linda	Golden Shiner (>5 cm) JAXCLB005	Bluegill (6-12 cm) JAXCLB003	Largemouth Bass (>20 cm) JAXCLB001
	Golden Shiner (<5 cm) JAXCLB006	Bluegill (<6 cm) JAXCLB004	Largemouth Bass (12-24 cm) JAXCLB002
	Gizzard Shad (<20 cm) JAXCLB007		
Lake Scotlis	Gizzard Shad (>20 cm) JAXLSB005	Bluegill (6-12 cm) JAXLSB003	Largemouth Bass (>20 cm) JAXLSB001
		Bluegill (>12 cm) JAXLSB004	Largemouth Bass (12-24 cm) JAXLSB002

Notes: No biota samples were recovered from the Polishing Pond (see page 2-1).

cm = centimeters.

fish carcasses were discarded prior to this discussion, therefore, samples JAXCLB001, JAXCLB002, and JAXCL003 were analyzed as liver and gonads only.

Each dissected portion of the original biota sample was analyzed for Target Compound List (TCL) semivolatile organic compounds (SVOCs), TCL pesticides and polychlorinated biphenyls (PCBs), and Target Analyte List (TAL) inorganic compounds, including cyanide.

In conjunction with the electrofishing activities, three surface water and three sediment samples were collected from each surface water body: Lake Casa Linda, Lake Scotlis, and the Polishing Pond. The surface water and sediment samples were collected at the locations shown on Figures 2-1 and 2-2. The surface water and sediment samples were collected in accordance with procedures in the U.S. Environmental Protection Agency (USEPA) *Standard Operating Procedures and Quality Assurance Manual* (February 1, 1991b).

Surface water and sediment samples were analyzed for TCL volatile organic compounds (VOCs), TCL SVOCs, TCL pesticides and PCBs, and TAL inorganics, including cyanide. Surface water and sediment samples were analyzed and reported in accordance with Naval Energy and Environmental Support Activity (NEESA) Level C (USEPA Level III) data quality objectives (DQOs). Following the laboratory analysis, the data were then validated as required under the NEESA Level C protocol. The validated analytical results are included in Appendix C of this report.

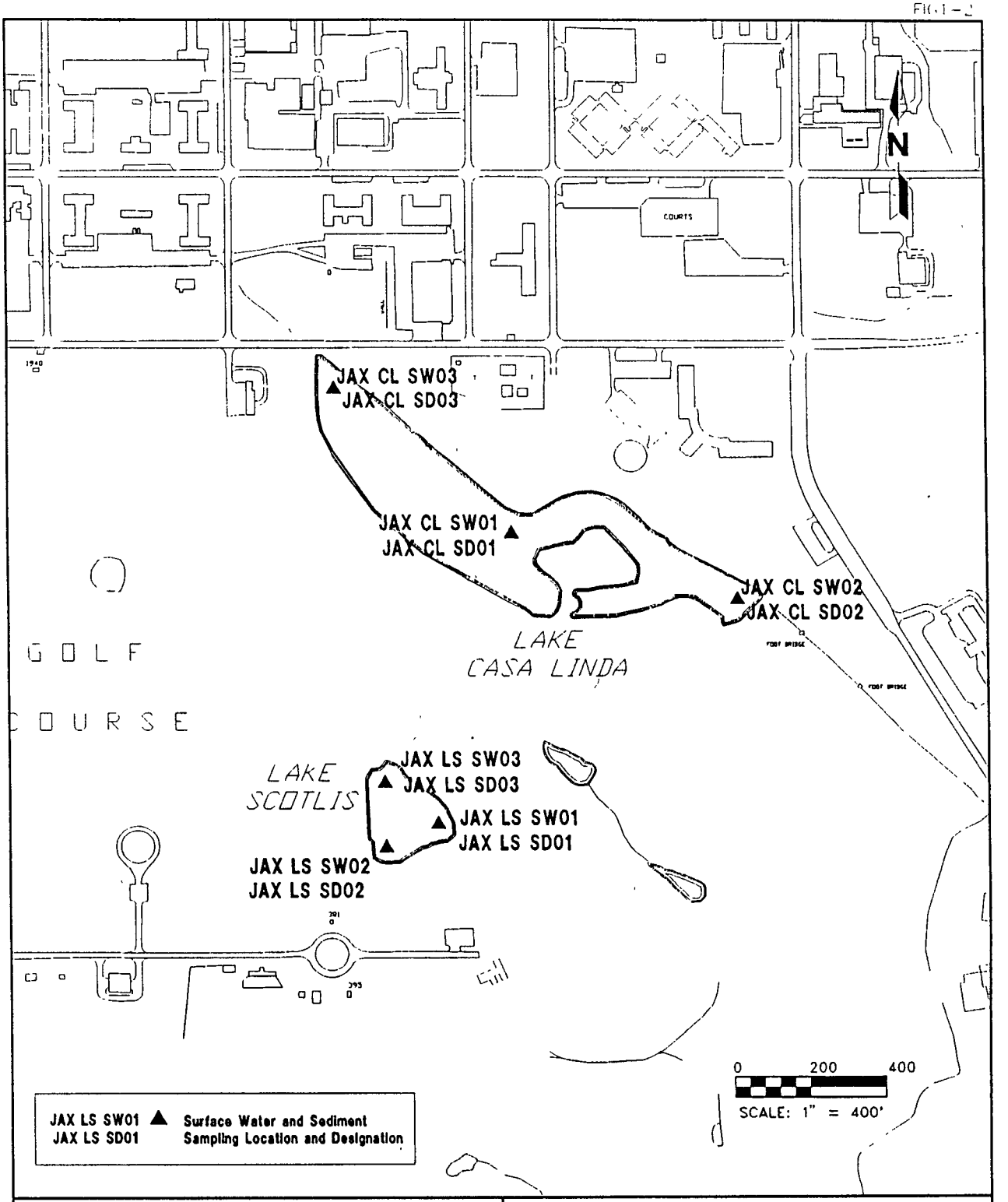

FIGURE 2-1
LAKE CASA LINDA AND LAKE SCOTLIS
SITE MAP AND SAMPLING LOCATIONS

FISHERIES INVESTIGATION
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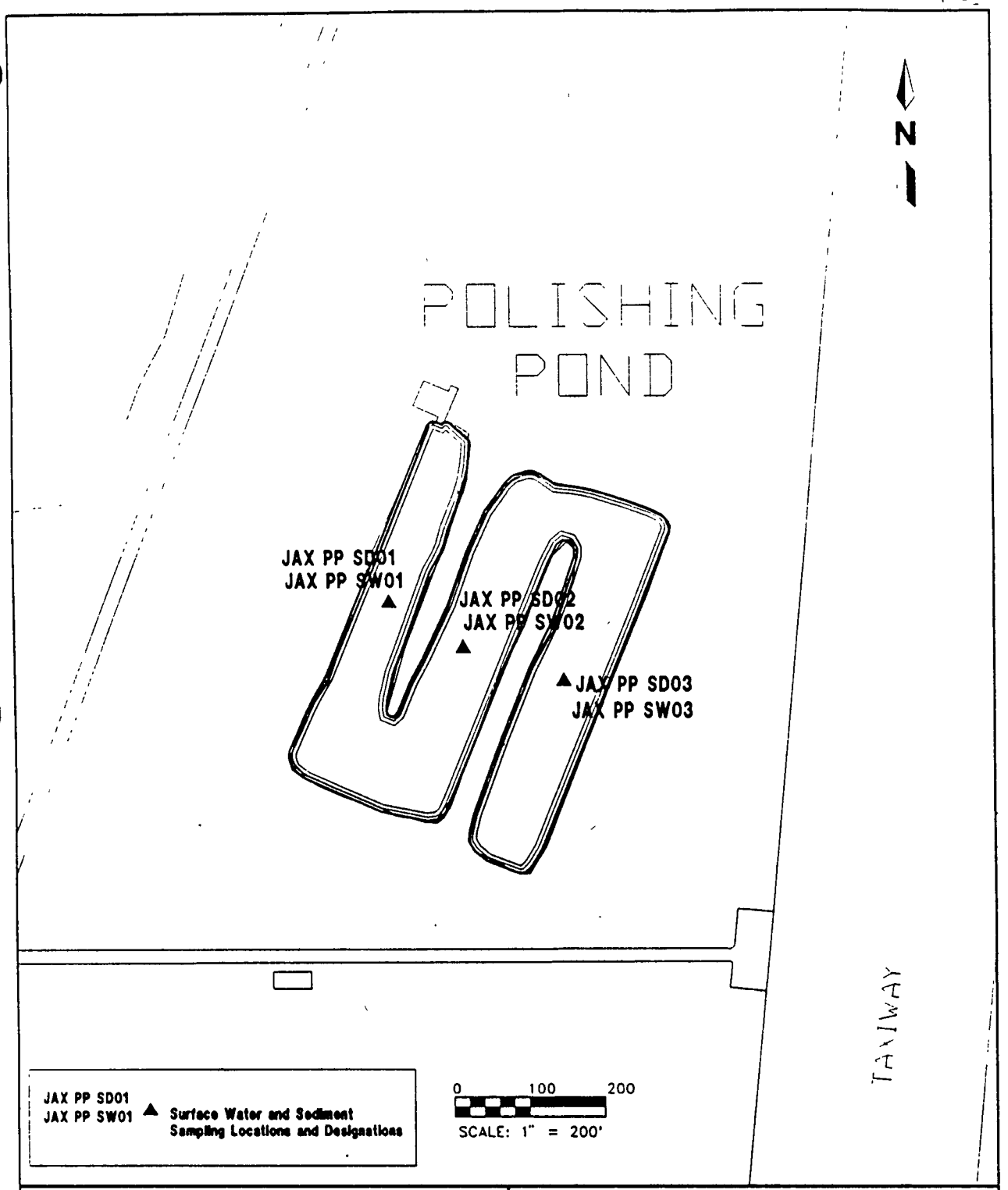

FIGURE 2-2
POLISHING POND SITE MAP
AND SAMPLING LOCATIONS

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3.0 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

3.1 FIELD QA/QC. Two types of QA/QC samples were used to monitor the existence and magnitude of contamination not attributable to the site but introduced during the field activities and the preparation and analysis of the samples in the laboratory. QA/QC sample types included equipment rinsate blanks and trip blanks. The following sections describe each of the types of QA/QC blanks. Field QA/QC samples were not applicable in the collection of biota samples.

3.1.1 Equipment Rinsate Blanks After a piece of sampling equipment was decontaminated, it was rinsed with organic free, deionized water. A sample of this rinse water was collected and submitted as an equipment rinsate blank. The purpose of the blank was to assess contamination that may have been introduced due to incomplete equipment decontamination. Equipment rinsate samples were collected at the same time as the surface water or sediment samples and analyzed for the same parameters. A summary of the analytical results for detected compounds in the rinsate blanks is presented in Table 3-1. The rinsate blanks collected for the surface water samples were designated sample P-159-RB11-01 and sample P-159-RB13-01. Rinsate blanks for the sediment samples were designated sample P-159-RB12-01 and sample P-159-RB14-01. One VOC, two SVOCs, and nine inorganic target analytes were detected in the rinsate samples (Table 3-1). The target analytes detected in the individual rinsate blank samples were assessed in the data validation process. The reported concentrations were greater than the laboratory instrument detection limits (IDL), but less than the contract required detection limits (CRDLs) and were qualified as estimated values. Surface water and sediment samples collected in conjunction with the individual rinsate samples were qualified to reflect the rinsate sample results.

3.1.2 Trip Blanks The trip blank is a sample of organic-free, deionized water that travels with the sample and is not opened at the site. The purpose of the trip blank sample is to assess the potential for contamination of the sample by VOCs during preparation, storage, transport, and analysis. The trip blanks were designated P-159-TB11-01 and P-159-TB12-01 and were analyzed for TCL VOCs only. The results are shown in Table 3-1. Chloroform and methylene chloride were found in the trip blank samples. The target analytes detected in the individual trip blank samples were assessed in the data validation process. The detected concentrations were below the CRDLs and greater than the IDL for the individual parameters and were qualified as estimated values. The samples associated with the individual trip blanks were qualified to reflect possible laboratory contamination.

3.2 DATA VALIDATION. The analytical records for the surface water and sediment samples generated by the subcontract laboratory, CH2M Hill, were validated by Heartland Environmental Services, Inc. (HES), of St. Peters, Missouri. Data validation was not conducted on the analytical data generated for the biota samples. Currently, the data validation process for biota samples has not been standardized and there are no functional guidelines established by the USEPA.

The purpose of the data review is to provide an independent check of the data quality with respect to the analytical method requirement. Based on this review, data use restrictions are made, if necessary, according to a unified approach

Table 3-1
Summary Analytical Results for QA/QC Samples

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Analytical Parameter	Surface Water Equipment Rinsate Blank Designation		Sediment Equipment Rinsate Blank Designation		Trip Blank Designation	
	P-159-RB11-01	P-159-RB13-01	P-159-RB12-01	P-159-RB14-01	P-159-TB11-01	P-159-TB12-01
Volatile Organic Compounds (VOCs)						
Carbon disulfide	10 U	9 J	10 U	10 U	10 U	10 U
Methylene chloride	10 U	10 U	10 U	10 U	2 J	2 J
Chloroform	10 U	10 U	10 U	10 U	1 J	1 J
Semivolatile Organic Compounds (SVOCs)						
Di-n-butylphthalate	10 U	2 J	10 U	2 J	--	--
bis(2-Ethylhexyl) phthalate	10 U	1 J	10 U	3 J	--	--
Inorganic Parameters						
Aluminum	25.2 B	24.3 U	24.3 U	24.3 U	--	--
Arsenic	0.68 U	0.72 B	0.98 U	0.68 U	--	--
Barium	0.84 U	0.97 B	0.84 U	0.71 B	--	--
Cadmium	3.6 B	2.8 U	2.8 U	2.8 U	--	--
Copper	3.5 B	1.2 U	3.7 B	1.2 U	--	--
Magnesium	18.7 B	16.2 U	15.3 U	23.3 U	--	--
Mercury	0.10 B	0.07 U	0.07 U	0.07 U	--	--
Nickel	9.7 B	9.4 U	9.4 U	9.4 U	--	--
Zinc	9.0 U	9.0 U	9.7 B	9.0 U	--	--

Notes: All concentrations reported as micrograms per liter ($\mu g/\ell$).

U = compound not present above detection limit, detection limit is listed.
J = estimated concentration.
-- = compound not analyzed.
B = reported concentration less than contract required detection limit (CRDL), but greater than or equal to instrument detection limit (IDL).
ND = compound not detected.

that uses quality control protocols in combination with technical expertise and professional judgment.

The review by HES was conducted in accordance with Level C data validation guidelines as specified by NEESA in the *Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program*, NEESA 20.2-47B, June 1988; USEPA's *Laboratory Data Validation Functional Guidelines for Evaluation Organic Analysis*, February 1, 1988; *Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analysis*, July 1, 1988; the *USEPA Contract Laboratory Program (CLP) Statement of Work* (March 1990); and the *National Functional Guidelines for Organic Data Review*.

Appendix C of this report contains a summary of the data reviewed by HES, and includes any data qualifications deemed necessary by the review process. The following is a description of the data qualifiers that were used by HES to indicate the data quality:

- U not detected above detection limit,
- J estimated value,
- UJ reported quantitation limit is qualified as estimated,
- R result is rejected and unusable,
- NJ presumptive evidence for the presence of the material at an estimated concentration,
- K result is biased high,
- L result is biased low.

The data qualifier "B" was not used by HES in the data qualification process. However, the subcontract laboratory, CH2M Hill, used the "B" qualifier for inorganic analysis to indicate that the reported value obtained was less than the CRDL, but greater than or equal to the IDL. In the organic data package the "B" qualifier was used to indicate the target analyte was detected in the associated blank as well as the sample. HES did not remove the qualifier during the data qualification process.

In addition, CH2M Hill used a "P" qualifier for pesticide compounds reported at greater than 25 percent difference between detected concentrations when run on separate gas chromatograph column. The data validation process performed by HES did not remove the qualifier.

3.3 QA/QC SUMMARY. The data reviewer estimates that less than 5 percent of the surface water and sediment analytical data required qualification. Overall, the chemical analytical data were judged to be fair, and the data can be used with the qualifications indicated to meet the purposes of the investigation.

4.0 ANALYTICAL RESULTS

The purpose of this section is to present the results of the surface water, sediment, and biota sampling event conducted at three surface water bodies at NAS Jacksonville. Section 4.1 presents the results of the surface water sampling and analysis. Section 4.2 presents the results of the sediment sampling and analysis. The last section, Section 4.3, presents the biota sampling and analysis results.

4.1 SURFACE WATER ASSESSMENT.

4.1.1 Surface Water Quality The surface water data from the three individual surface water bodies were evaluated with respect to the following Applicable or Relevant and Appropriate Requirements (ARARs):

- Federal Ambient Water Quality Criteria (AWQC) and
- Florida Surface Water Classification Standards (FSWCS).

Table 4-1 presents current water quality guidelines and standards. Additional standards including newly promulgated Federal Drinking Water maximum contaminant levels (MCLs) and maximum contaminant level goals (MCLGs) and Florida Drinking Water Standards are included in Table 4-1. Assuming these three water bodies are not used as a drinking water source, these standards are not applicable and are not discussed in the text of this report.

4.1.2 Surface Water Physical Parameters Prior to sample collection, physical parameters including pH, temperature, and specific conductance were measured at each sampling station. A summary of the surface water physical parameters is presented in Table 4-2.

The pH of surface water in the three lakes ranged from 6.7 to 11.7 standard units (SU). Lake Casa Linda had pH values ranging from 6.7 to 7.1 SUs and is more acidic than either Lake Scotlis or the Polishing Pond. Temperature differences between the three lakes ranged from 11.6 degrees Celsius (°C) to 19.4 °C. The extended range in temperature is probably due to variations in the time of day samples were collected (i.e., the cooler morning versus the warmer afternoon) and the shallow nature of the water bodies, which are quickly heated by solar energy.

Conductivity values for the three surface water bodies ranged from 200 to 600 micromhos per centimeter (μmhos/cm). These values are typical of small lakes with moderate concentrations of cations and anions.

4.1.3 Surface Water Analytical Results Table 4-3 summarizes the analytical results for surface water samples collected at Lake Casa Linda, Lake Scotlis, and the Polishing Pond.

4.1.3.1 Volatile Organic Compounds (VOCs) No VOCs were detected in any of the three surface water samples collected at the three surface water bodies.

4.1.3.2 Semivolatile Organic Compounds (SVOCs) Four SVOCs, carbazole, di-n-butylphthalate, pyrene, and bis(2-ethylhexyl)phthalate were detected in the surface water samples above IDLs; however, all reported concentrations were

Table 4-1
Applicable or Relevant and Appropriate Requirements of Surface Water and Sediment Samples

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Chemical Name	Federal Standards and Guidance						Florida Standards and Guidance				
	Safe Drinking Water Act (SDWA)[a]		CWA Ambient Water Quality Criteria[b]				Drinking Water Standards[c,h]	Surface Water Quality Standards[d]		NOAA Sediment ER-L Guidelines[i] (µg/kg)	USEPA Sediment Quality Criteria[j] (µg/kg)
			For Protection of Human Health		For Protection of Aquatic Life						
	MCL[f] (µg/l)	MCLG[f] (µg/l)	Water and Fish Consumption (µg/l)	Fish Consumption only (µg/l)	Fresh Water Acute/Chronic (µg/l)	Marine Acute/Chronic (µg/l)	MCL (µg/l)	Class II (µg/l)	Class III Fresh/Marine (µg/l)		
Volatile Organics											
Acetone	--	--	--	--	--/--	--/--	--	--	--/--	--	--
Benzene	5	0	0.66	40	[g]5,300/--	[g]5,100/700	1	[22]71.28	[22]71 28/71.28	--	--
Bromodichloromethane (dichlorobromomethane)	[7]100	--	--	--	--/--	-/-	[7]100	[22]22	[22]22/22	--	--
Bromoform	[7]100	--	--	--	--/--	--/--	[7]100	[22]360	[22]360/360	--	--
Bromomethane (methyl bromide)	--	--	--	--	--/--	--/--	--	--	--/--	--	--
2-Butanone (methyl ethyl ketone)	--	--	--	--	--/--	--/--	--	--	--/--	--	--
Carbon disulfide	--	--	--	--	--/--	--/--	--	--	--/--	--	--
Carbon tetrachloride	5	0	0 4	6.49	[g]35,200/--	[g]50,000/--	3	[22]4.42	[22]4.42/4.42	--	--
Chlorobenzene (monochlorobenzene)	100	100	488	--	[1,g]250/50	[1,g]160/129	100	--	--/--	--	--
Chloroethane (ethyl chloride)	--	--	--	--	--/--	--/--	--	--	--/--	--	--

See notes at end of table.

Table 4-1 (Continued)
Applicable or Relevant and Appropriate Requirements of Surface Water and Sediment Samples

Sampling Event Report No. 17
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Chemical Name	Federal Standards and Guidance						Florida Standards and Guidance				
	Safe Drinking Water Act (SDWA)[a]		CWA Ambient Water Quality Criteria[b]				Drinking Water Standards[c,h]	Surface Water Quality Standards[d]		NOAA Sediment ER-L Guidelines[i] (µg/kg)	USEPA Sediment Quality Criteria[j] (µg/kg)
			For Protection of Human Health		For Protection of Aquatic Life						
	MCL[f] (µg/l)	MCLG[f] (µg/l)	Water and Fish Consumption (µg/l)	Fish Consumption only (µg/l)	Fresh Water Acute/Chronic (µg/l)	Marine Acute/Chronic (µg/l)	MCL (µg/l)	Class II (µg/l)	Class III Fresh/Marine (µg/l)		
2-Chloroethylvinyl ether	--	--	--	--	--/--	--	--	--	--/--	--	--
Chloroform	[7]100	--	0.19	15.7	[g]28,900/1,240	--/--	[7]100	[22]470.8	[22]470 8/470.8	--	--
Chloromethane (methyl chloride)	--	--	--	--	--/--	--/--	--	[22]470 8	[22]470 8/470.8	--	--
Dibromochloromethane (chlorodibromomethane)	[7]100	--	--	--	--/--	--/--	[7]100	[22]34	[22]34/34	--	--
1,1-Dichloroethane	--	--	--	--	--/--	--/--	--	--	--/--		
1,2-Dichloroethane	5	0	0.94	2.43	[g]118,000/20,000	[g]118,000/--	3	--	--/--	--	--
1,1-Dichloroethene (1,1-Dichloroethylene)	7	7	0.033	1.85	--/--	--/--	7	[22]3.2	[22]3 2/3.2	--	--
cis-1,2-Dichloroethene (cis-1,2-Dichloroethylene)	70	70	--	--	--/--	--/--	70	--	--/--	--	--
trans-1,2-Dichloroethene (trans-1,2-Dichloroethylene)	100	100	--	--	--/--	--/--	100	--	--/--	--	--
1,2-Dichloropropane	5	0	--	--	--/--	--/--	5	--	--/--	--	--
cis-1,3-Dichloropropene	--	--	--	--	--/--	--/--	--	--	--/--	--	--

See notes at end of table.

Table 4-1 (Continued)
Applicable or Relevant and Appropriate Requirements of Surface Water and Sediment Samples

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Chemical Name	Federal Standards and Guidance						Florida Standards and Guidance				
	Safe Drinking Water Act (SDWA)[a]		CWA Ambient Water Quality Criteria[b]				Drinking Water Standards [c,h]	Surface Water Quality Standards[d]		NOAA Sediment ER-L Guidelines[i] (µg/kg)	USEPA Sediment Quality Criteria[j] (µg/kg)
			For Protection of Human Health		For Protection of Aquatic Life						
	MCL[f] (µg/ℓ)	MCLG[f] (µg/ℓ)	Water and Fish Consumption (µg/ℓ)	Fish Consumption only (µg/ℓ)	Fresh Water Acute/Chronic (µg/ℓ)	Marine Acute/Chronic (µg/ℓ)	MCL (µg/ℓ)	Class II (µg/ℓ)	Class III Fresh/Marine (µg/ℓ)		
trans-1,3-Dichloropropene	--	--	--	--	--/--	--/--	--	--	--/--	--	--
Ethyl benzene	700	700	1,400	3,280	[g]32,000 /--	[g]430/--	700	--	---/---	--	--
2-Hexanone	-	-	-	-	--/--	--/--	-	-	--/--	--	--
4-Methyl-2-pentanone (methyl isobutyl ketone)	--	--	--	--	--/--	--/--	--	--	--/--	--	--
Methylene chloride (dichloromethane)	5(g)	0(g)	--	--	--/--	--/--	5	[22]1,580	[22]1,500/1,500	--	--
Styrene	100	100	--	--	--/--	--/--	100	--	--/--	--	--
1,1,2,2-Tetrachloroethane	--	--	0.17	10.7	[g]--/2,400	[g]9,020/--	--	[22]10 8	[22]10 8/10.8	--	--
Tetrachloroethylene (1,1,2,2-tetrachloroethene)	5	0	0.8	8.85	[g]5,280/840	[g]10,200/5,-000	3	[22]8.85	[22]8.85/8.85	--	--
Toluene	1,000	1,000	14,300	424,000	[g]17,500/--	[g]6,300/5,000	1,000	--	--/--	--	--
1,1,1-Trichloroethane	200	200	18,400	1,030,000	--/--	[g]31,200/--	200	173,000	173,000	--	--
1,1,2-Trichloroethane	5(g)	3(g)	0.6	41.8	[g]--/9,400	--/--	5	--	--/--	--	--
Trichloroethene (trichloroethylene)	5	0	2.7	80.7	[g]45,000/21,900	[g]2,000/--	3	[22]80.7	[22]80.7/80 7	--	--

See notes at end of table.

Table 4-1 (Continued)
Applicable or Relevant and Appropriate Requirements of Surface Water and Sediment Samples

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Chemical Name	Federal Standards and Guidance						Florida Standards and Guidance				
	Safe Drinking Water Act (SDWA)[a]		CWA Ambient Water Quality Criteria[b]				Drinking Water Standards[c,h]	Surface Water Quality Standards[d]		NOAA Sediment ER-L Guidelines[i] (µg/kg)	USEPA Sediment Quality Criteria[i] (µg/kg)
			For Protection of Human Health		For Protection of Aquatic Life						
	MCL[f] (µg/ℓ)	MCLG[f] (µg/ℓ)	Water and Fish Consumption (µg/ℓ)	Fish Consumption only (µg/ℓ)	Fresh Water Acute/Chronic (µg/ℓ)	Marine Acute/Chronic (µg/ℓ)	MCL (µg/ℓ)	Class II (µg/ℓ)	Class III Fresh/Marine (µg/ℓ)		
Vinyl acetate	--	--	--	--	--/--	--/--	--	--	--/--	--	--
Vinyl chloride	2	0	2	525	--/--	--/--	1	--	--/--	--	--
Xylenes (total)	10^4	10^4	--	--	--/--	--/--	10^4	--	--/--	--	--
Semivolatile Organics											
Acenaphthene	--	--	--	--	[g]1,700 /520	[g]970/710	--	2,700	2,700/2,700	--	--
Acenaphthylene	--	--	--	--	--/--	--/--	--	([19])	([19])	--	--
Anthracene	--	--	--	--	--/--	--/--	--	[19]110,000	[19]110,000	85	--
Benzo(a)anthracene	[12]0.1	[12]0	--	--	--/--	--/--	--	([19])	([19])	230	13,200
Benzo(a)pyrene	0.2(g)	0(g)	--	--	--/--	--/--	0.2	([19])	([19])	400	10,600
Benzo(b)fluoranthene	[12]0.2	[12]0	--	--	--/--	--/--	--	([19])	([19])	--	--
Benzo(k)fluoranthene	0.2([12])	[12]0	--	--	--/--	--/--	--	([19])	([19])	--	--
Benzo(g,h,i)perylene	--	--	--	--	--/--	--/--	--	([19])	([19])	--	--
Benzoic acid	--	--	--	--	--/--	--/--	--	--	--/--	--	--
Benzyl alcohol	--	--	--	--	--/--	--/--	--	--	--/--	--	--

See notes at end of table.

Table 4-1 (Continued)
Applicable or Relevant and Appropriate Requirements of Surface Water and Sediment Samples

Sampling Event Report No. 17
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NAS Jacksonville, Florida

Chemical Name	Federal Standards and Guidance						Florida Standards and Guidance				
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			For Protection of Human Health		For Protection of Aquatic Life						
	MCL[f] (µg/ℓ)	MCLG[f] (µg/ℓ)	Water and Fish Consumption (µg/ℓ)	Fish Consumption only (µg/ℓ)	Fresh Water Acute/Chronic (µg/ℓ)	Marine Acute/Chronic (µg/ℓ)	MCL (µg/ℓ)	Class II (µg/ℓ)	Class III Fresh/Marine (µg/ℓ)		
4-Bromophenyl-phenylether	--	--	--	--	--/--	--/--	--	--	--/--	--	--
Butylbenzylphthalate	[12]100	[12]0	--	--	--/--	--/--	--	--	--/--		--
4-Chloro-3-methylphenol (4-chloro-m-creosol)	--	--	--	--	[6]30/--	--/--	--	([23])	([23])	--	--
4-chloroaniline	--	--	--	--	--/--	--/--	--	--	--/--	--	--
bis(2-Chloroethoxyl methane	--	--	--	--	--/--	--/--	--	--	--/--	--	--
bis(2-Chloroethyl) ether	--	--	0.03	1 36	--/--	--/--	--	--	--/--	--	--
bis(2-Chloroisopropyl) ether	--	--	--	--	--/--	--/--	--	--	--/--	--	--
2-Chloronaphthalene	--	--	--	--	[6,24]1,600/--	[6,24]7 5/--	--	--	--/--	--	--
2-Chlorophenol	--	--	--	--	[6]4,380/--	--/--	--	400	400/400	--	--
4-Chlorophenyl-phenylether	--	--	--	--	--/--	--/--	--	--	--/--	--	--
Chrysene	[12]0.2	[12]0	--	--	--/--	--/--	--	([19])	([19])	400	--
di-n-Butylphthalate	--	--	--	--	--/--	--/--	--	--	[18]3/--	--	--
di-n-Octylphthalate (p-phthalic acid)	--	--	--	--	--/--	--/--	--	--	[18]3/--	--	--

See notes at end of table.

Table 4-1 (Continued)
Applicable or Relevant and Appropriate Requirements of Surface Water and Sediment Samples

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Chemical Name	Federal Standards and Guidance						Florida Standards and Guidance				
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			For Protection of Human Health		For Protection of Aquatic Life						
	MCL[f] (µg/l)	MCLG[g] (µg/l)	Water and Fish Consumption (µg/l)	Fish Consumption only (µg/l)	Fresh Water Acute/Chronic (µg/l)	Marine Acute/Chronic (µg/l)	MCL (µg/l)	Class II (µg/l)	Class III Fresh/Marine (µg/l)		
Dibenzo(a,h)anthracene	[12]0.3	[12]0	--	--	--/--	--/--	--	([19])	([19])	60	--
Dibenzofuran	--	--	--	--	--/--	--/--	--	--	--/--	--	--
1,2-Dichlorobenzene (o-dichlorobenzene)	600	600	--	--	[16]250/50	[16]160/129	600	--	--/--	--	--
1,3-Dichlorobenzene (m-dichlorobenzene)	600	600	--	--	[16]250/50	[16]160/129	--	--	--/--	--	--
1,4-Dichlorobenzene (p-dichlorobenzene)	75	75	--	--	[16]250/50	[16]160/129	75	--	--/--	--	--
3,3'-Dichlorobenzidine	--	--	0.0103	0.0204	--/--	--/--	--	--	--/--	--	--
2,4-Dichlorophenol	--	--	3,090	--	[6]2,020/350	--/--	--	790	790/790	--	--
Diethylphthalate	--	--	350,000	1,800,000	--/--	--/--	--	--	--/--	--	--
Dimethylphalate	--	--	313,000	2,900,000	--/--	--/--	--	--	--/--	--	--
2,4-Dimethylphenol	--	--	--	--	[6]2,120/--	--/--	--	--	--/--	--	--
4,6-Dinitro-2-methylphenol	--	--	--	--	--/--	--/--	--	--	--/--	--	--
2,4-Dinitrophenol	--	--	70	14,300	--/--	--/--	--	14,260	14,260	--	--
2,4-Dinitrotoluene	--	--	0.11	9.1	[6]330/230	[6]590/370	--	[22]9 1	[22]9.1/9 1	--	--

See notes at end of table.

Table 4-1 (Continued)
Applicable or Relevant and Appropriate Requirements of Surface Water and Sediment Samples

Sampling Event Report No. 17
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Chemical Name	Federal Standards and Guidance						Florida Standards and Guidance				
	Safe Drinking Water Act (SDWA)[a]		CWA Ambient Water Quality Criteria[b]				Drinking Water Standards[c,h]	Surface Water Quality Standards[d]		NOAA Sediment ER-L Guidelines[i] (µg/kg)	USEPA Sediment Quality Criteria[j] (µg/kg)
			For Protection of Human Health		For Protection of Aquatic Life						
	MCL[f] (µg/ℓ)	MCLG[f] (µg/ℓ)	Water and Fish Consumption (µg/ℓ)	Fish Consumption only (µg/ℓ)	Fresh Water Acute/Chronic (µg/ℓ)	Marine Acute/Chronic (µg/ℓ)	MCL (µg/ℓ)	Class II (µg/ℓ)	Class III Fresh/Marine (µg/ℓ)		
2,6-Dinitrotoluene	--	--	--	--	--/--	[6]590/370	--	--	--/--	--	--
bis(2-Ethylhexyl) phthalate (di-2-ethylhexylphthalate)	6(g)	0(g)	15,000	50,000	[12]400/360	[12]400/360	4	--	[16]3/--	--	--
Fluoranthene	--	--	42	54	[6]3,980/--	[6]40/16	--	370	370/370	600	18,800
Fluorene	--	--	--	--	--/--	--/--	--	[18]14,000	[18]14,000	35	--
Hexachlorobenzene	1(g)	0(g)	0.00072	0.00074	[12]6/3.68	[1,6]160/129	1	--	--/--	--	--
Hexachlorobutadiene	--	--	0.45	50	[6]90/9.3	[6]32/--	--	[22]49.7	[22]49.7/49.7	--	--
Hexachlorocyclopentadiene	[5]50(g)	50(g)	206	--	[6]7/5 2	[6]7/--	50	--	--/--	--	--
Hexachloroethane	--	--	1 9	8.74	[6]980/540	[6]940/--	--	--	--/--	--	--
Indeno(1,2,3-cd) pyrene	[12]0.4	[12]0	--	--	--/--	--/--	0.4	([19])	([19])	--	--
Isophorone	--	--	5,200	520,000	[6]117,000 /--	[6]12,900/--	--	--	--/--	--	--
2-Methylnaphthalene	--	--	--	--	--/--	--/--	[21]100(h)	--	--/--	65	--
2-Methylphenol (o-creosol)	--	--	--	--	--/--	--/--	--	--	--/--	--	--
4-Methylphenol (p-creosol)	--	--	--	--	--/--	--/--	--	--	--/--	--	--

See notes at end of table.

Table 4-1 (Continued)
Applicable or Relevant and Appropriate Requirements of Surface Water and Sediment Samples

Sampling Event Report No. 17
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Chemical Name	Federal Standards and Guidance						Florida Standards and Guidance				
	Safe Drinking Water Act (SDWA)[a]		CWA Ambient Water Quality Criteria[b]				Drinking Water Standards [c,h]	Surface Water Quality Standards[d]		NOAA Sediment ER-L Guidelines[j] (µg/kg)	USEPA Sediment Quality Criteria[j] (µg/kg)
			For Protection of Human Health		For Protection of Aquatic Life						
	MCL[f] (µg/l)	MCLG[f] (µg/l)	Water and Fish Consumption (µg/l)	Fish Consumption only (µg/l)	Fresh Water Acute/Chronic (µg/l)	Marine Acute/Chronic (µg/l)	MCL (µg/l)	Class II (µg/l)	Class III Fresh/Marine (µg/l)		
Naphthalene	--	--	--	--	[6]2,300/620	[6]2,350/--	[21]100(h)	--	--/--	340	--
Nitrobenzene	--	--	19,800	--	[6]27,000 /--	[6]6,680/--	--	--	--/--	--	--
2-Nitroaniline (o-nitroaniline)	--	--	--	--	--/--	--/--	--	--	--/--	--	--
3-Nitroaniline (m-nitroaniline)	--	--	--	--	--/--	--/--	--	--	--/--	--	--
4-Nitroaniline (p-nitroaniline)	--	--	--	--	--/--	--/--	--	--	--/--	--	--
Nitrophenols	--	--	--	--	[6]230/150	[6]4,850/--	--	--	--/--	--	--
N-nitroso-di-n-propylamine	--	--	--	--	--/--	--/--	--	--	--/--	--	--
N-nitrosodiphenylamine	--	--	4.9	16.1	--/--	--/--	--	--	--/--	--	--
Pentachlorophenol	1	0	1,010	--	[23]20/13	13/7.9	1	7.9	[22]7.9	--	--
Phenanthrene	--	--	--	--	[12]30/6.3	[12]7.7/4.6	--	([18])	([18])	225	1.29
Phenol	--	--	3,500	--	[6]10,200/2,560	[6]5,800/--	--	4,600,000	4,600,000	--	--
Pyrene	--	--	--	--	--/--	--/--	--	[18]11,000	[18]11,000	350	13,100
2,4,5-Trichlorophenol	--	--	2,600	--	[12]100/63	[12]240/11	--	([33])	([33])	--	--

See notes at end of table.

Table 4-1 (Continued)
Applicable or Relevant and Appropriate Requirements of Surface Water and Sediment Samples

Sampling Event Report No. 17
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Chemical Name	Federal Standards and Guidance						Florida Standards and Guidance				
	Safe Drinking Water Act (SDWA)[a]		CWA Ambient Water Quality Criteria[b]				Drinking Water Standards [c,n]	Surface Water Quality Standards[d]		NOAA Sediment ER-L Guidelines[l] (µg/kg)	USEPA Sediment Quality Criteria[l] (µg/kg)
			For Protection of Human Health		For Protection of Aquatic Life						
	MCL[f] (µg/ℓ)	MCLG[f] (µg/ℓ)	Water and Fish Consumption (µg/ℓ)	Fish Consumption only (µg/ℓ)	Fresh Water Acute/Chronic (µg/ℓ)	Marine Acute/Chronic (µg/ℓ)	MCL (µg/ℓ)	Class II (µg/ℓ)	Class III Fresh/Marine (µg/ℓ)		
2,4,6-Trichlorophenol	--	--	1.2	3.6	[e]--/970	--/--	--	[22,33]6 5	[22,33]6 5/6.5	--	--
Pesticides/PCBs											
Aroclor	2	0	--	--	--/--	--/--	2	--	--/--	--	--
Aldrin	--	--	0 000074	0.000079	3/--	1.3/--	--	[18,22]0 00014	[18,22]0 00014		
Atrazine	3	3	--	--	--/--	--/--	3	--	--/--	--	--
alpha-BHC	--	--	--	--	[e]100/--	[e]0.34/--	--	--	--	--	--
beta-BHC	--	--	--	--	[e]100/--	[e]0.34/--	--	[22]0 046	[22]0 046/0 046	--	--
delta-BHC	--	--	--	--	[e]100/--	[e]0.34/--	--	--	--	--	--
Carbonfuran	40	40	--	--	--/--	--/--	40	--	--/--	--	--
Chlordane	2	0	0 00046	0.00048	2.4/ 0 0043	0 09/ 0.004	2	[22,26]0.00059	[22,26]0 00059		
2,4-D	70	70	100	--	--/--	--/--	70	--	--/--	--	--
4,4-DDD	--	--	--	--	--/--	--/--	--	--	--/--	2	--
4,4-DDE	--	--	--	--	[e]1,050/--	[e]14/--	--	--	--/--	2	--
4,4-DDT	--	--	0.000024	0.000024	1.1/0 001	0.13/0.001	--	[22,27]0 00059	[22,27]0 00059	1	8 28

See notes at end of table.

Table 4-1 (Continued)
Applicable or Relevant and Appropriate Requirements of Surface Water and Sediment Samples

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Chemical Name	Federal Standards and Guidance						Florida Standards and Guidance				
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	MCL[f] (µg/ℓ)	MCLG[f] (µg/ℓ)	Water and Fish Consumption (µg/ℓ)	Fish Consumption only (µg/ℓ)	Fresh Water Acute/Chronic (µg/ℓ)	Marine Acute/Chronic (µg/ℓ)	MCL (µg/ℓ)	Class II (µg/ℓ)	Class III Fresh/Marine (µg/ℓ)		
Dibromochloropropane	0.2	0	--	--	--/--	--/--	0.2	--	--/--	--	--
Dieldrin	--	--	0.000071	0.00076	2 5/0 0019	0 71/0.0019	--	[22,28]0 00014	[22,28]0 00014	0 02	1.3
Endosulfan (I and II)	--	--	--	--	0 22/0.056	0.034/0 0087	--	0 0087	0.056/0 0087	--	--
Endosulfan sulfate	--	--	--	--	--/--	--/--	--	--	--/--	--	--
Endrin	2(g)	2(g)	1	--	0.18/0.0023	0.037/0 0036	2	0 00023	0.00023	0.02	0 533
Endrin aldehyde	--	--	--	--	--/--	--/--	--	--	--/--	--	--
Endrin ketone	--	--	--	--	--/--	--/--	--	--	--/--	--	--
Ethylene dibromide	0.05	0	--	--	--/--	--/--	0.02	--	--/--	--	--
Heptachlor	0.4	0	0.00028	0.00029	0.52/0.0038	0.053/0.0036	0 4	[22,29]0.00021	[22,29]0.00021	--	1.1
Heptachlor epoxide	0.2	0	--	--	0.52/0.0038	0.053/0.0036	0 2	--	--/--	--	--
Lindane	0.2	0	0.0186	0.0625	2/0.08	0.16/--	0 2	[22,30]0.063		--	1.57
Methoxychlor	40	40	100	--	--/--	--/0.03	40	0.03	0 03/0 03	--	--
PCBs	0.5	0	0.000079	0.000079	2/0.014	10/0.03	0.5	[22,31]0.000045	[22,31]0 000045	50	195
Silvex (2,4,5-TP)	50	50	10	--	--/--	--/--	10	--	--/--	--	--

See notes at end of table.

Table 4-1 (Continued)
Applicable or Relevant and Appropriate Requirements of Surface Water and Sediment Samples

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Chemical Name	Federal Standards and Guidance						Florida Standards and Guidance				
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	MCL[f] (µg/ℓ)	MCLG[f] (µg/ℓ)	Water and Fish Consumption (µg/ℓ)	Fish Consumption only (µg/ℓ)	Fresh Water Acute/Chronic (µg/ℓ)	Marine Acute/Chronic (µg/ℓ)	MCL (µg/ℓ)	Class II (µg/ℓ)	Class III Fresh/Marine (µg/ℓ)		
Toxaphene	3	0	0 00071	0.00073	0.73/0.0002	0 21/0 0002	3	0 0002	0 0002	--	--
Metals/Inorganics											
Aluminum	[10]500/200	--	([3])	([3])	([3])	([3])	[10]200	1,500	--/1,500	--	--
Antimony	6(g)	6(g)	146	45,000	[12]88/30	[12]1,500/500	6	4,300	4,300/4,300	2	--
Arsenic	[4]50	--	0.0022	0.0175	--/--	--/--	50	50	50/50	--	--
Arsenic (III)	--	--	--	--	360/190	69/36	--	36	--/36	--	--
Arsenic (V)	--	--	--	--	[8]850/--	[8]2,319/--	--	--	--/--	--	--
Asbestos	7MFL	[24]7MFL	30k fibers/L	--	--/--	--/--	[24]7MFL	--/--	--	--	--
Barium	2,000	2,000	1,000	--	--/--	--/--	2,000	--	--/--	--	--
Beryllium	4(g)	4(g)	0 0037	0 0641	[8]130/5.3	--/--	4	[22]0 13	[22]0.13/0.13	--	--
Cadmium	5	5	10	--	[11]3.9/1.1	43/9 3	5	9 3	[17]9 3	5	--
Calcium	--	--	--	--	--/--	--/--	--	--	--/--	--	--
Chromium	100	100	--	--	--/--	--/--	100	--	--/--	80	--
Chromium (III)	--	--	170,000	3,433,000	[11]1,700/ 210	[8]10,300/-	--	673,000	[17]673000	--	--

See notes at end of table.

Table 4-1 (Continued)
Applicable or Relevant and Appropriate Requirements of Surface Water and Sediment Samples

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Chromium (VI)	--	--	50	--	16/11	1,100/50	--	50	11/50	--	--
Cobalt	--	--	--	--	--/--	--/--	--	--	--/--	--	--
Copper	[16]100	1,300	--	--	[11]18/12	2.9/--	[16]1,000	2 9	[17]2 9	70	--
Cyanide	[12]200(g)	[12]200(g)	200	--	22/5 2	1/--	200	1	5.2/1	--	--
Fluoride	[16]200	200	--	--	--/--	--/--	[25]4,000	--	--/--	--	--
Iron	[16]300	--	300	--	-/1,000	--/--	[16]300	300	1,000/300	--	--
Lead	TT[g]	0	50	--	[11]83/3 2	220/8.5	15	5 6	[17]5 6	35	--
Magnesium	--	--	--	--	--/--	--/--	--	--	--/--	--	--
Manganese	[16]50	[12]0.2	50	100	--/--	--/--	[16]50	100	--/--	--	--
Mercury	2	2	0.144	0.146	2.4/0 012	2.1/0 0025	2	0 025	0 012/0 2	0.15	--
Nickel	100(g)	100(g)	13.4	100	[11]1,400/160	75/8 3	100	8 3	[17]8.3	30	--
Nitrate (as N)	10,000	10,000	10,000	--	--/--	--/--	10,000	--	--/--	--	--
Nitrite (as N)	1,000	1,000	--	--	--/--	--/--	--	--	--/--	--	--
Nitrate + nitrite (both as N)	10,000	10,000	--	--	--/--	--/--	--	--	--/--	--	--

See notes at end of table.

Table 4-1 (Continued)
Applicable or Relevant and Appropriate Requirements of Surface Water and Sediment Samples

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			For Protection of Human Health		For Protection of Aquatic Life						
	MCL[f] (µg/ℓ)	MCLG[f] (µg/ℓ)	Water and Fish Consumption (µg/ℓ)	Fish Consumption only (µg/ℓ)	Fresh Water Acute/Chronic (µg/ℓ)	Marine Acute/Chronic (µg/ℓ)	MCL (µg/ℓ)	Class II (µg/ℓ)	Class III Fresh/Marine (µg/ℓ)		
Potassium	--	--	--	--	--/--	--/--	--	--	--/--	--	--
Selenium	50	50	10	--	20/5	300/71	50	71	5/71	--	--
Silver	[10]100	--	--	--	[11,18]4.1/0.12	[18]2 3/--	[18]100	0 05	0.07/0.05	1	--
Sodium	([13])	--	--	--	--/--	--/--	160,000	--	--/--	--	--
Thallium	2(g)	0.5(g)	--	--	--/--	--/--	2	48	48/48	--	--
Vanadium	--	--	--	--	--/--	--/--	--	--	--/--	--	--
Zinc	[10]5,000	--	--	--	[11]120/110	95/86	[10]5,000	86	[17]86	120	--

See notes on following page.

Table 4-1 (Continued)
Applicable or Relevant and Appropriate Requirements of Surface Water and Sediment Samples

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Sources:

(a) U.S. Environmental Protection Agency (USEPA), SDWA National Primary Drinking Water Regulations per 40 CFR 141: maximum contaminant level (MCLs) and maximum contaminant limit goal (MCLGs).
(b) USEPA, *Water Quality Criteria Summary*, Office of Science and Technology, Health and Ecological Criteria Division, Washington, D.C. May 1, 1991.
(c) Florida Administrative Code, 17-550, *Safe Drinking Water Act*, January, 1991.
(d) Florida Administrative Code, 17-302, *Surface Water Quality Standards*, amended between March and August, 1992.
(e) Florida Administrative Code, 17-775, *Soil Thermal Treatment Facilities*, December, 1990.
(f) USEPA, *Drinking Water Standards and Health Advisories*, Office of Water, Washington, DC, November, 1991.
(g) USEPA, *National Primary and Secondary Drinking Water Regulations; Synthetic Organic Chemicals and Inorganic Chemicals; Final Rule*, 57FR31777, July 17, 1992.
(h) Florida Administrative Code, 17-550, *Safe Drinking Water Phase V Standards*, January 1, 1993.
(i) National Oceanic and Atmospheric Administration (NOAA), Technical Memorandum No. 5 OMA 52. *The Potential for Biological Effects of Sediment-Sorbed Contaminants tested in the National Status and Trends Program*, March, 1990. Edward R. Long and Lee G. Morgan, Seattle, WA.
(j) USEPA, *Interim Sediment Criteria Values for Nonpolar Hydrophobic Organic Contaminants*; Office of Water Regulations and Standards; SCD No. 17; Washington, DC, 1988.

[1] Standard indicated is for chlorinated benzenes as a group.
[2] Standard for aldicarb sulfone is 4 micrograms per liter (µg/ℓ) and aldicarb sulfoxide is 2 µg/ℓ.
[3] Criteria are pH dependent. Refer to 53FR33178.
[4] MCL for arsenic currently under review.
[5] Secondary MCL of 8 µg/ℓ proposed for hexachlorocyclopentadiene.
[6] Insufficient data to develop criteria. Value presented is the Lowest Observed Effect Level (LOEL).
[7] Standard indicated is the standard for total trihalomethanes (i.e., the sum of concentrations of chloroform, bromodichloromethane, dibromochloromethane, and bromoform). Refer to 56FR3579 and Florida Administrative Code, 17-550.
[8] Proposed standard for aldicarb sulfone is 2 µg/ℓ and aldicarb sulfoxide is 4 µg/ℓ.
[9] Treatment Technique (TT) requirement.
[10] Secondary MCL.
[11] Hardness dependent criteria (100 milligrams per liter (mg/ℓ) calcium carbonate ($CaCO_3$) used.
[12] Proposed standard or criteria.
[13] No MCL has been set for sodium. However, a reporting level of 20 mg/ℓ has been established. Monitoring is required and data is reported to health officials to protect individuals on a highly restricted sodium diet.
[14] Standard indicated is for total volatile organic aromatics (VOAs) (i.e., the sum of concentrations of benzene, toluene, ethylbenzene, and total xylene).
[15] Different levels are proposed (marine acute, 7.2 µg/ℓ; marine chronic, 0.92 µg/ℓ; and freshwater acute, 0.92 µg/ℓ).
[16] Not to exceed 1.3 µg/ℓ (Class II or Class II marine) or 3.0 µg/ℓ (Class III fresh water).

Table 4-1 (Continued)
Applicable or Relevant and Appropriate Requirements of Surface Water and Sediment Samples

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[17] Hardness-dependent Values are in $\mu g/\ell$, with (ln H) = natural logarithm of the total hardness expressed as mg/ℓ calcium carbonate ($CaCO_3$).

cadmium	$= e^{(0.7852(\ln H)-3.49)}$	lead	$= e^{(1.273(\ln H)-4.705)}$
chromium (III)	$= e^{(0.819(\ln H)+1.561)}$	nickel	$= e^{(0.846(\ln H)-1.1645)}$
copper	$= e^{(0.8545(\ln H)-1.465)}$	zinc	$= e^{(0.8473(\ln H)+0.7614)}$

[18] Standard indicated is for phthalate esters.
[19] Polycyclic aromatic hydrocarbons (PAHs) (i.e., the sum of concentrations of acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene) shall not exceed 0.031 $\mu g/\ell$ at annual average flow conditions.
[20] Not used.
[21] Standard indicated is the cleanup criteria for the sum of naphthalene and methylnaphthalene.
[22] At average annual flow conditions.
[23] This standard is pH dependent; 7.8 pH used. Refer to 51FR43666.
[24] Units for asbestos MCLs are millions of fibers per liter for fibers longer than 10 micrometers.
[25] Fluoride also has a secondary MCL of 2,000 $\mu g/\ell$.
[26] Not to exceed 0.004 $\mu g/\ell$ (Class II or Class III marine) or 0.0043 $\mu g/\ell$ (Class III fresh water).
[27] Not to exceed 0.001 $\mu g/\ell$.
[28] Not to exceed 0.0019 $\mu g/\ell$.
[29] Not to exceed 0.0036 $\mu g/\ell$ (Class II or Class III marine) or 0.0038 $\mu g/\ell$ (Class III fresh water).
[30] Not to exceed 0.16 $\mu g/\ell$ (Class II or Class III marine) or 0.08 $\mu g/\ell$ (Class III fresh water).
[31] Not to exceed 0.03 $\mu g/\ell$ (Class II or Class III marine) or 0.014 $\mu g/\ell$ (Class III fresh water).
[32] This standard is pH dependent. Concentration limit ($\mu g/\ell$) $= e^{(1.005(pH)-5.29)}$, not to exceed 30 $\mu g/\ell$ at any time. [Not to exceed 8.2 $\mu g/\ell$ at average annual flow conditions. Rule reference (d)]
[33] Phenolic compounds as listed. Total chlorinated phenols, including trichlorophenols, and chlorinated creosols shall not exceed 1.0 $\mu g/\ell$ except as set forth in sub-sub-paragraph 1-6 below or unless higher values are shown not to be chronically toxic.
[34] Standard indicated is for chlorinated naphthalenes as a group.

Notes:
SDWA = Safe Water Drinking Act.
CWA = Clean Water Act.
MCL = Maximum Contaminant Level.
$\mu g/\ell$ = micrograms per liter.
MCLG = Maximum Contaminant Level Goal.
Class II = Shellfish Propagation or Harvesting.
Class III = Recreation, Fish & Wildlife Propagation.
TCLP = Toxicity Characteristic Leachate Procedure.
$\mu g/kg$ = micrograms per kilogram.
TT = treatment technique (requirements are in effect).
NOAA = National Oceanic and Atmospheric Administration.
ER-L = Effects Range Low.
USEPA = U.S. Environmental Protection Agency.
PCBs = polychlorinated biphenyls.

Table 4-2
Surface Water Physical Parameters

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Sample Location Number	Date Measured	pH (SU)	Temperature (°C)	Conductivity (μmhos/cm)
Lake Casa Linda				
JAXCLSW01	2/03/93	6.7	12.0	206
JAXCLSW02	2/03/93	6.7	11.6	332
JAXCLSW03	2/03/93	7.1	13.3	200
Lake Scotlis				
JAXLSSW01	2/03/93	10.6	19.4	355
JAXLSSW02	2/03/93	8.0	19.4	285
JAXLSSW03	2/03/93	11.7	17.2	250
Polishing Pond				
JAXPPSW01	2/08/93	9.0	18.9	380
JAXPPSW02	2/08/93	8.0	15.5	460
JAXPPSW03	2/08/93	9.0	19.4	600

Notes: SU = standard unit.
°C = degrees Celsius.
μmhos/cm = micromhos per centimeter.

Table 4-3
Summary Analytical Results for Surface Water Samples at Lake Casa Linda, Lake Scotlis, and the Polishing Pond

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Analytical Parameter	Lake Casa Linda			Lake Scotlis				Polishing Pond		
	JAXCL-SW01	JAXCL-SW02	JAXCL-SWO3	JAXLS-SW01	JAXLS-SW01D	JAXLS-SW02	JAXLS-SW03	JAXPP-SW01	JAXPP-SW02	JAXPP-SW03
Semivolatile Organic Compounds (SVOCs)										
Carbazole (110)	2 BJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 J	10 U
Di-n-butylphthalate (10)	2 BJ	10 U	10 U	10 U	1 J	10 U	10 U	1 J	10 U	1 J
Pyrene (10)	1 BJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl) phthalate (10)	2 BJ	10 U	10 U	10 U	2 J	10 U	10 U	1 U	10 U	10 U
Inorganic Compounds										
Aluminum (200)	35.2 B	45.4 B	39.7 B	51.1 B	51.9 B	41.4 B	38 9 B	63 9 B	270	264
Arsenic (10)	1.7 U	1.4 U	2.0 U	1.7 U	1.8 U	1.4 U	0.76 U	1 4 B	1.5 B	1.0 B
Barium (200)	42.6 B	49.6 B	43.2 B	37.2 B	36.3 B	36 9 B	37.4 B	10.4 B	12.9 B	12 9 B
Cadmium (5)	2.8 U	2.8 U	2.8 U	2.8 U	2.8 U	2.8 U	2.8 U	3.1 B	2.8 U	5.4
Calcium (5,000)	23,200	24,300	23,500	23,200	23,000	23,200	23,500	34,300	33,600	33,500
Chromium (10)	2.8 U	2.8 U	2.8 U	2.8 U	2.8 U	2.8 U	2.8 U	29.4	28 9	39 2
Copper (25)	1.2 U	1.2 U	3.2 B	4 0 B	3.5 B	3.5 B	2.9 B	4.3 B	5.3 B	8 3 B
Cyanide (10)	3.7 B	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	3 0 B	7 5 B	12.7
Iron (100)	334	791	292	243	214	275	241	373	404	425
Lead (5)	1.7 U	3.3	1.7 U	4.7	5.4	4.2	4.3	3.1	2.8 B	2.2 B
Magnesium (5,000)	6,500	6,590	6,530	11,700	11,500	11,700	11,700	13,700	13,500	13,500
Manganese (15)	6 7 B	9.2 B	6.8 B	3.8 B	3.3 B	3.9 B	3.4 B	54.0	51 5	51 5
Mercury (0.2)	0.07 U	0.08 B	0.07 U	0.07 U	0.07 U	0.07 U	0.07 U	0.07 U	0 07 U	0 07 ~~U~~
Nickel (40)	9.4 U	9.4 U	9.4 U	9.4 U	9.4 U	9.4 U	9.4 U	43.0	49.2	48 9
Potassium (5,000)	3,230 B	3,180 B	3,340 B	1,520 B	1,420 B	1,500 B	1,170 B	7,240	7,320	7,250
Selenium (5)	1.8 U	1.8 U	1.9 B	1.8 U	1.8 U	1.8 U	1.8 U	1 8 U	1.8 U	1.8 U
Sodium (5,000)	6,440	6,750	6,690	8,290	8,200	8,300	8,320	19,600	20,300	20,200
Zinc (20)	9.0 U	9.0 U	9.8 B	14.6 B	12.3 B	9.0 U	11.4 B	12 B	26.2	20.6

[1] Numbers in parenthesis is the U.S. Environmental Protection Agency (USEPA) Contract Required Detection Limit (CRDL) for low concentration water samples.

Notes: All concentrations reported as micrograms per liter ($\mu g/\ell$).
U = compound not identified above detection limit, detection limit is listed.
J = estimated concentration.
B = reported concentration less than contract required detection limit (CRDL), but greater than or equal to instrument detection limit (IDL).

qualified by the data validation process as estimated, because they were detected at concentrations less than the CRDL.

4.1.3.3 Pesticides and Polychlorinated Biphenyls (PCBs) No pesticides or PCB compounds were detected in surface water samples from any of the three surface water bodies.

4.1.3.4 Inorganic Parameters Thirteen inorganic compounds including: aluminum, cadmium, calcium, chromium, cyanide, iron, lead, magnesium, manganese, nickel, potassium, sodium, and zinc were detected in surface water samples at concentrations that exceeded their individual CRDLs. The surface water samples collected from the Polishing Pond, contained the highest detected concentrations of inorganic compounds. The individual analytes and concentration ranges detected in samples from the Polishing Pond include: aluminum (264 to 270 micrograms per liter [$\mu g/\ell$]), cadmium (5.4 $\mu g/\ell$) calcium (33,500 to 34,300 $\mu g/\ell$), chromium (28.9 to 39.2 $\mu g/\ell$), cyanide (12.7 $\mu g/\ell$), iron (373 to 425 $\mu g/\ell$), lead (3.1 $\mu g/\ell$), magnesium (13,500 to 13,700 $\mu g/\ell$), manganese (51.5 to 54.0 $\mu g/\ell$), nickel (43.0 to 49.2 $\mu g/\ell$) potassium (7,240 to 7,320 $\mu g/\ell$) sodium (19,600 to 20,300 $\mu g/\ell$), and zinc (20.6 to 26.2 $\mu g/\ell$).

4.1.4 Surface Water Applicable or Relevant and Appropriate Requirements (ARARs) This section compares the analytical results for surface water samples and the ARARs presented in Section 4.1.1 and Table 4-1.

4.1.4.1 VOCs, SVOCs, Pesticides, and PCBs None of the VOCs, SVOCs, pesticides, nor PCBs exceed any of the surface water ARARs.

4.1.4.2 Inorganic Analytes Surface water samples from Lake Casa and Lake Scotlis contained three inorganic compounds, copper, iron, and mercury, at concentrations exceeding the FSWCS. Five surface water samples (JAXCLSW03, JAXLSSW01, JAXLSSW01D, JAXLSSW02, and JAXLSSW03) collected from Lake Casa Linda and Lake Scotlis were reported to contain copper concentrations that met or exceeded the FSWCS for Class II and Class III waters (2.9 $\mu g/\ell$); however, all reported concentrations were less than CRDLs. Iron was detected in samples JAXCLSW01 and JAXCLSW02 (334 and 791 $\mu g/\ell$, respectively) at concentrations that exceed FSWCS Class II standard of 300 $\mu g/\ell$. Mercury was detected in sample JAXCLSW02 (0.08 B $\mu g/\ell$) at a concentration exceeding the FSWCS Class II Standard of 0.025 $\mu g/\ell$.

Six inorganic compounds (aluminum, arsenic, cyanide, cadmium, iron, and nickel) in surface water samples collected at the Polishing Pond were determined to exceed one or more of the ARARs. Concentrations of aluminum detected in samples JAXPPSW02 (270 $\mu g/\ell$) and JAXPPSW03 (264 $\mu g/\ell$) were reported to exceed the chronic AWQC of 87 $\mu g/\ell$. All three surface water samples collected from the Polishing Pond contained arsenic at concentrations exceeding the AWQC water and fish consumption guidelines of 0.0022 $\mu g/\ell$ and the fish consumption only guideline of 0.0175 $\mu g/\ell$. Cadmium was detected in sample JAXPPSW03 at a concentration 5.4 $\mu g/\ell$, which exceeds the acute AWQC of 3.9 $\mu g/\ell$.

Two samples from the Polishing Pond (JAXPPSW02 and JAXPPSW03) were reported to contain concentrations of cyanide at 7.5 B $\mu g/\ell$ and 12.7 $\mu g/\ell$, respectively, that exceed the chronic AWQC and Florida Class II (1 $\mu g/\ell$) and Class III (5.2 $\mu g/\ell$) standards. All reported concentrations of iron and nickel detected in the

surface water samples exceed the FSWCS for Class II waters of 300 and 8.3 µg/ℓ, respectively.

4.2 SEDIMENT ASSESSMENT.

4.2.1 Sediment Quality Sediment samples from the three individual surface water bodies were evaluated with respect to the following ARARs:

- National Oceanic and Atmospheric Administration (NOAA) Effects Range Low (ER-L) for sediments, and
- USEPA Sediment Quality Criteria.

The individual ARAR requirement for each parameter is presented in Table 4-1 of this report.

4.2.2 Sediment Sample Analytical Results Table 4-4 summarizes the analytical results for sediment samples collected at Lake Casa Linda and Lake Scotlis. Table 4-5 presents the analytical results for the sediment samples collected at the Polishing Pond. The complete analytical data summary sheets are included in Appendix C.

4.2.2.1 VOCs A single VOC (4-methyl-2-pentanone at 4 J micrograms per kilogram (µg/kg) was detected in the sediment sample JAXLSSD0201 at Lake Scotlis. The reported concentration was qualified as "estimated" by the data evaluation process because the concentration was less than CRDLs. No VOCs were detected in sediment samples recovered from Lake Casa Linda.

Sediment samples collected from the Polishing Pond were reported to contain four VOCs: acetone, 2-butanone, carbon disulfide, and toluene. Acetone was detected in two of the three samples, JAXPPSD02 and JAXPPSD03, at concentrations of 1,000 µg/kg and 1,400 µg/kg, respectively. The VOCs: 2-butanone, carbon disulfide, and toluene were detected in all three sediment samples at concentrations ranging from 330 to 1,200 µg/kg for 2-butanone; 18 J to 110 J µg/kg for carbon disulfide; and 74 J to 270 J µg/kg for toluene.

4.2.2.2 SVOCs A total of 13 SVOC compounds were detected in sediment samples collected from Lake Casa Linda and Lake Scotlis. Sample JAXCLSD02 was reported to contain all 13 detected compounds. These compounds include: anthracene (63 J µg/kg), benzo(a)anthracene (880 µg/kg), benzo(a)pyrene (790 µg/kg), benzo(b)fluoranthene (1,300 µg/kg), benzo(g,h,i)perylene (270 J µg/kg), benzo(k)fluoranthene (1,200 µg/kg), bis(2-ethylhexyl)phthalate (660 J), butylbenzylphthalate (66 J µg/kg), chrysene (1,300 µg/kg), fluoranthene (1,900 µg/kg), indeno(1,2,3-cd)pyrene (650 µg/kg), phenanthrene (500 J µg/kg), and pyrene (1,500 µg/kg). In addition, sample JAXCLSD02 contained the highest concentrations of detected compounds.

Only two SVOC compounds: 2,4-dinitrophenol and bis(2-ethylhexyl)phthalate were detected in sediments samples collected at the Polishing Pond. 2,4-Dinitrophenol was detected in a single sample, JAXPPSD01, at a concentration of 170,000 µg/kg, whereas bis(2-ethylhexyl)phthalate was detected in all three sediment samples at concentrations ranging from 30,000 J µg/kg to 60,000 J µg/kg; however, all concentrations of bis(2-ethylhexyl)phthalate were qualified as estimated.

Table 4-4
Summary Analytical Results for Sediment Samples at Lake Casa Linda and Lake Scotlis

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Analytical Parameter	Lake Casa Linda			Lake Scotlis			
	JAXCL-SD01	JAXCL-SD02	JAXCL-SD03	JAXLS-SD01	JAXLS-SD01D[1]	JAXLS-SD02	JAXLS-SD03
Volatile Organic Compounds (VOCs)							
Acetone	150 U	16 U	91 U	19 U	21 U	59 U	14 U
4-Methyl-2-pentanone	91 U	16 U	91 U	19 U	21 U	4 J	14 U
Semivolatile Organic Compounds (SVOCs)							
Anthracene	3,300 U	63 J	3,000 U	530 U	530 U	790 U	450 U
Benzo(a)anthracene	3,300 U	880	3,000 U	110 J	530 U	790 U	450 U
Benzo(a)pyrene	3,300 U	790	3,000 U	87 J	530 U	99 J	450 U
Benzo(b)fluoranthene	440 J	1,300	320 J	120 J	530 U	120 J	450 U
Benzo(g,h,i)perylene	3,300 U	270 J	3,000 U	530 U	530 U	790 U	450 U
Benzo(k)fluoranthene	380 J	1,200	3,000 U	87 J	530 U	94 J	450 U
bis(2-Ethylhexyl)phthalate	1,200 J	660 J	590 J	470 J	66 J	970	450 U
Butylbenzylphthalate	3,300 U	66 J	3,000 U	530 U	530 U	790 U	450 U
Chrysene	3,300 U	1,300	590 J	120 J	530 U	110 J	450 U
Fluoranthene	440 J	1,900	420 J	190 J	78 J	140 J	450 U
Indeno(1,2,3-cd)pyrene	3,300 U	650	3,000 U	530 U	530 U	110 J	450 U
Phenanthrene	3,300 U	500 J	3,000 U	70 J	530 U	790 U	450 U
Pyrene	430 J	1,500	3,000 U	130 J	57 J	110 J	450 U
Pesticides and Polychlorinated Biphenyls (PCBs)							
Aroclor-1254	410 J	520 U	230 J	110 U	53 U	83	45 U
Carbazole	3,300 U	170 J	3,000 U	530 U	530 U	790 U	450 U
4,4'-DDD	66 U	18 JP	60 U	11 U	5.3 U	7.9 U	4.5 U
4,4'-DDE	74	9.5 J	51 J	3.2 J	2.0 JP	7.3 J	4.5 U
alpha-Chlordane	34 U	33	31 U	5.5 U	2.7 U	4.0 U	2.3 U
gamma-Chlordane	34 U	30 P	31 U	5.5 U	2.7 U	4.0 U	2.3 U
Inorganics, mg/kg							
Aluminum	15,800	1,100	12,000	1,420	1,240	16,300	542
Arsenic	91.1	3.6 B	50.8	0.68 B	0.71 B	1.9 B	0.36 B
Barium	104 B	17.8 B	93.0 B	5.6 B	5.3 B	41.7 B	2.5 B

See notes at end of table.

Table 4-4 (Continued)
Summary Analytical Results for Sediment Samples at Lake Casa Linda and Lake Scotlis

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Analytical Parameter	Lake Casa Linda			Lake Scotlis			
	JAXCL-SD01	JAXCL-SD02	JAXCL-SD03	JAXLS-SD01	JAXLS-SD01D[1]	JAXLS-SD02	JAXLS-SD03
Inorganics, mg/kg--continued							
Beryllium	2.2 B	0.21 U	1.1 B	0.22 U	0.15 U	0.49 U	0.12 U
Cadmium	8.3 B	1.0 U	5.4 U	0.96 U	1.1 B	1.9 B	0.84 U
Calcium	7,390	3,080	7,460 B	536 B	421 B	1,520 B	189 U
Chromium	43.4	3.3 B	33.4	4.4	3.7	26.7	2.1 B
Cobalt	6.9 B	0.99 U	5.1 U	0.92 U	0.94 U	1.4 U	0.80 U
Copper	262	6 8 B	236	22.3	20.4	94.0	4.8 B
Cyanide	1.5 U	0.26 U	1.4 U	0.24 U	0.25 U	0.38 U	0.74 B
Iron	55,200	6,140	43,700	925	899	5,550	339
Lead	492	691	261	38.4	40.0	106	7.8
Magnesium	1,530 B	354 B	1,220 B	132 B	109 B	849 B	54.2 B
Manganese	55.6	27.2	77.2	3.7 B	3.3 B	14.6	4.1 B
Mercury	0.16 B	0.01 U	0.12 B	0.01 B	0.01 B	0.04 B	0.01 B
Nickel	20.2 U	3.5 U	19.0 B	3.5 B	3.3 U	10.7 B	2.8 U
Silver	4.3 U	0.75 U	3.9 U	0.69 U	0.71 U	2.7 B	0.60 U
Sodium	2,350 B	361 U	1,980 B	373 U	374 U	630 U	290 U
Vanadium	59.2 B	5.0 B	40.9 B	2.4 B	2.2 B	18.0 B	1.2 B
Zinc	637	51.1	377	24.1	19.7	131	7.6

[1] Duplicate sample of JAXLSSDO1.

Notes: All concentrations reported as micrograms per kilogram (µg/kg) unless noted otherwise.
U = compound not identified above detection limit, detection limit is listed.
J = estimated concentration.
P = indicates a pesticide analyte with a greater than 25 percent difference for detected concentrations between gas chromatograph (GC) columns.
B = reported concentration less than contract required detection limit (CRDL), but greater than or equal to instrument detection limit (IDL).
D = diluted samples.
mg/kg = milligrams per kilograms.
DDD = dichlorophenyl dichloroethane.
DDE = dichlorophenyl dichloroethane.

Table 4-5
Summary Analytical Results for Sediment Samples at the Polishing Pond

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Analytical Parameter	JAXPPSD01	JAXPPSD02	JAXPPSD03
Volatile Organic Compounds (VOCs)			
Acetone	400 U	1,000	1,400
2-Butanone	1,000	330	360
Carbon disulfide	10 J	18 J	28 J
Toluene	270 J	83	74 J
Semivolatile Organic Compound (SVOC			
2,4-Dinitrophenol	170 000	53,000 UJ	100,000 UJ
bis(2-Ethylhexyl)phthalate	30,000 J	44,000 J	60,000 J
Pesticides and Polychlorinated Biphenyls (PCBs)			
alpha-Chlordane	22 JP	30 P	29 JP
gamma-Chlordane	19 JP	22 JP	20 JP
Inorganics, mg/kg			
Aluminum	6,410	7,240	6,410
Antimony	5 U	16.3 U	43.2 U
Arsenic	6 B	5.7 B	7.8 B
Barium	1,530	1,520	1,450
Beryllium	0.79 B	0.44 U	0.87 B
Cadmium	565	577	338
Calcium	22,700	20,300	19,200
Chromium	33,600	24,300	20,700
Cobalt	5 U	2.7 B	7.0 U
Copper	922	976	872
Cyanide	8 B	19.7	25.6 B
Iron	23,000	14,500	24,500
Lead	718	858	768
Magnesium	2,360 B	2,570 B	2,400
Manganese	442	377	290

See notes at end of table.

Table 4-5 (Continued)
Summary Analytical Results for Sediment Samples at the Polishing Pond

Sampling Event Report No. 17
Fisheries Investigation
NAS Jacksonville, Florida

Analytical Parameter	JAXPPSD01	JAXPPSD02	JAXPPSD03
Inorganics, mg/kg--continued			
Mercury	3.9	5.9	1.7
Nickel	406	318	272
Potassium	2,310 U	929 U	2,460 U
Selenium	5.1 B	3.0 B	7.8 B
Silver	385	355	319
Sodium	2,880 B	1,250 B	5,630 B
Vanadium	44.3 B	43.1 B	37.2 B
Zinc	1,510	1,060	686

Notes: All concentrations reported as micrograms per liter (µg/kg) unless noted otherwise.
U = compound not identified above detection limit, detection limit is listed.
J = estimated concentration.
P = indicates a pesticide analyte with a greater than 25 percent difference for detected concentrations between gas chromatograph (GC) columns.
B = reported concentration less than contract required detection limit (CRDL), but greater than or equal to instrument detection limit (IDL).
D = diluted samples.
mg/kg = milligrams per kilogram.

4.2.2.3 Pesticide Compounds Five pesticide compounds were detected in the sediment samples collected at Lake Casa Linda and Lake Scotlis. Four of the five compounds: carbazole (170 J µg/kg), 4,4'-DDD (18 JP µg/kg), alpha chlordane (33 µg/kg), and gamma chlordane (30 P µg/kg) were only detected in a single sample, JAXCLSD02. The remaining compound 4,4'-DDE was detected in six of the seven samples at concentrations ranging from 2.0 JP µg/kg to 74 µg/kg.

Two pesticide compounds, alpha- and gamma-chlordane, were detected in the three sediment samples collected at the Polishing Pond. Alpha-chlordane was detected at concentrations ranging from 22 JP µg/kg to 30 P µg/kg and gamma-chlordane was detected at concentrations ranging from 19 JP µg/kg to 22 JP µg/kg.

4.2.2.4 PCB Compounds Aroclor-1254 was the only PCB detected in sediment samples collected at Lake Casa Linda and Lake Scotlis. The compound was identified in two of the samples JAXCLSD01, and JAXCLSD03 from Lake Casa Linda and one sample, JAXLSSD02, from Lake Scotlis at concentrations ranging from 83 to 410 J µg/kg.

4.2.2.5 Inorganics Thirteen inorganic parameters were detected above CRDLs in sediment samples collected at Lake Casa Linda and Lake Scotlis. Four of the compounds, aluminum, iron, lead, and zinc, were detected in each sample at concentrations exceeding the CRDLs.

Sediment samples collected at the Polishing Pond were reported to contain 18 inorganic parameters at concentrations exceeding the CRDL. Eleven of the compounds were detected above CRDLs in every sediment sample collected. The eleven inorganic parameters and the detected range in concentrations are as follows: aluminum (6,410 to 7,240 milligrams per kilogram [mg/kg], barium (1,450 to 1,530 mg/kg), cadmium (338 to 577 mg/kg), calcium (19,200 to 22,400 mg/kg), chromium (20,700 to 24,300 mg/kg), copper (832 to 976 mg/kg), iron (14,500 to 24,500 mg/kg), lead (718 to 858 mg/kg), manganese (290 to 442 mg/kg), mercury (1.7 to 5.9 mg/kg), and silver (319 to 385 mg/kg).

4.2.3 Sediment ARAR Evaluation This section compares the laboratory results of sediment samples and the ARARs presented in Section 4.1.1 and Table 4-1.

4.2.3.1 VOCs NOAA and USEPA guidance values are not available for VOCs in sediments.

4.2.3.2 SVOCs Only samples from Lake Casa Linda contained SVOCs that exceeded the NOAA ER-L guidelines. The SVOCs that exceed the guidelines included: chrysene (samples JAXCLSD02, 1300 µg/kg; JAXCLSD03, 590 µg/kg; NOAA, 400 µg/kg), fluoranthene (sample JAXCLSD02, 1,900 µg/kg; NOAA, 600 µg/kg), phenanthrene (sample JAXCLSD02, 500 J µg/kg; NOAA, 225 µg/kg), and pyrene (samples JAXCLSD01, 430 J µg/kg, NOAA; 350 µg/kg and JAXCLSD02; 1,500 µg/kg). In addition, the concentrations of phenanthrene (500 J µg/kg) and pyrene (1,500 µg/kg) detected in sample JAXCLSD02 exceed the USEPA sediment quality criteria standards of 1.29 µg/kg and 13,100 µg/kg, respectively.

None of the SVOCs detected in the sediment samples recovered from Lake Scotlis or the Polishing Pond exceeded current ARARs.

4.2.3.3 Pesticides and PCBs Six of the seven sediment samples (JAXCLSD01, 74 µg/kg; JAXCLSD02, 9.55 µg/kg; JAXCLSD03, 51 J µg/kg; JAXLSSD01, 3.2 J; JAXLSSD01D, 2.0 JP; and JAXCLSSD02, 7.3 J µg/kg) collected at Lake Casa Linda and Lake Scotlis were reported to contain the pesticide compound 4,4'-DDE at concentration exceeding the NOAA sediment ER-L guideline concentration of 2 µg/kg. In addition, a single sample (JAXCLSD02) recovered from Lake Casa Linda contained 4,4-DDD (18 JP µg/kg) exceeding the NOAA ambient ER-2 guidelines of 2 µg/kg. The NOAA guidelines for total PCBs (50 µg/kg) was exceeded at sampling locations JAXCLSD01 (410 J µg/kg), JAXLSSD02 (83 µg/kg), and JAXCLSD03 (230 J µg/kg). The reported concentrations at locations JAXCLSD01 and JAXCLSD02 also exceeded the USEPA sediment quality criteria standard of 195 µg/kg.

4.2.3.4 Inorganics There are no USEPA inorganic guidelines for sediments. NOAA sediment ER-L guidelines for inorganic compounds are presented in Table 4-1. The NOAA guidelines for cadmium (5 mg/kg) was exceeded at one sampling location, JAXCLSD01 (8.3 B mg/kg) at Lake Casa Linda and all three sampling locations at the Polishing Pond, JAXPPSD01 (355 mg/kg), JAXPPSD02 (577 mg/kg), and JAXPPSD03 (338 mg/kg). Chromium (NOAA, 80 mg/kg) was exceeded at all three Polishing Pond sampling locations: JAXPPSD01, (23,600 mg/kg), JAXPPSD02 (24,300 mg/kg), and JAXPPSD03 (20,700 mg/kg). The NOAA guideline concentration for lead, 35 mg/kg, was exceeded at each sampling location within the three water bodies except one location at Lake Scotlis (JAXLSSD03). Mercury concentrations in sediment samples JAXCLSD01 (0.16 B mg/kg), JAXPPSD01 (3.9 mg/kg), JAXPPSD02 (5.9 mg/kg), and JAXPPSD03 (1.7 mg/kg) exceeded the NOAA guideline of 0.15 mg/kg. Guidelines for nickel (NOAA, 30 mg/kg) concentrations were exceeded in each sample collected in the Polishing Pond (JAXPPSD01, 406 mg/kg; JAXPPSD02, 318 mg/kg; and JAXPPSD03, 272 mg/kg). Silver (NOAA, 1 mg/kg) was exceeded in samples JAXLSSD02 (2.7 B mg/kg), JAXPPSD01 (385 µg/kg), JAXPPSD02 (355 µg/kg), and JAXPPSD03 (319 mg/kg). Finally, zinc (NOAA, 120 mg/kg) was exceeded at sample locations JAXCLSD01 (637 mg/kg), JAXCLSD03 (377 mg/kg), JAXLSSD02 (131 mg/kg), JAXPPSD01 (1,510 mg/kg), JAXPPSD02 (1,060 mg/kg), and JAXPPSD03 (626 mg/kg).

4.3 BIOTA SAMPLE ASSESSMENT.

4.3.1 Biota Quality There are currently no published ARARs for contaminant concentrations in biota samples. A mechanism for evaluating contaminant concentrations is to use risk-based calculations. This risk-based evaluation is outside the current scope of this investigation.

4.3.2 Analytical Results for Biota Samples Tables 4-6 and 4-7 present a summary of the SVOCs, pesticide and PCB compounds, and the inorganic compounds detected in biota collected from Lake Casa Linda and Lake Scotlis, respectively. The complete analytical data summary forms are included in Appendix C.

4.3.2.1 SVOCs Three SVOCs: bis(2-ethylhexyl)phthalate, di-n-butylphthalate, and 4-methylphenol were detected in the biota samples collected from Lake Scotlis and Lake Casa Linda. However, all detected concentrations (except 4-methylphenol (14,000 µg/ℓ) detected in the fillet portion of biota sample JAXCL003) were reported with the qualifier "J" indicating an estimated concentration.

4.3.2.2 Pesticide Compounds Three pesticide compounds: alpha-chlordane, 4,4'-dichlorophenyl dichloroethane (DDD), and dichlorophenyl dichloroethene (DDE) were reported above IDLs in biota samples collected at Lakes Scotlis and Casa Linda.

Table 4-6
Summary Analytical Results for Biota Samples at Lake Casa Linda

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Fisheries Investigation
NAS Jacksonville, Florida

Sample Designation	JAXCLB001		JAXCLB002		JAXCLB003		JAXCLB004		JAXCLB00501		JAXCLB00601		JAXCLB00701	
	Fillet	Liver/Gonad	Fillet	Liver/Gonad	Fillet	Liver/Gonad	Fillet	Carcass	Fillet	Carcass	Fillet	Carcass	Fillet	Carcass
Analytical Parameters														
Semivolatile Organics Compounds (SVOCs)														
bis(2-Ethylhexyl) phthalate	2,000 U	82,000 U	2,000 U	50,000 U	2,000 U	50,000 U	2,000 U	2,000 U	4,000 U	4,000 U	4,000 U	4,000 U	4,000 U	4,000 U
Di-n-butylphthalate	2,000 U	82,000 U	2,000 U	50,000 U	2,000 U	50,000 U	2,000 U	2,000 U	4,000 U	4,000 U	4,000 U	4,000 U	4,000 U	4,000 U
4-Methylphenol	2,000 U	82,000 U	2,000 U	50,000 U	14,000	50,000 U	2,000 U	2,000 U	4,000 U	4,000 U	4,000 U	4,000 U	4,000 U	4,000 U
Pesticides and Polychlorinated Biphenyls (PCBs)														
a-Chlordane	5.1 U	51 U	5 1 U	10 U	5.1 U	26 U	5.1 U	5.1 U	6.7 P	5.1 U	13 P	30 DP	3.0 JP	13 P
4,4'-DDD	9.9 U	99 U	9.9 U	20 U	9.9 U	30 JP	9.9 U	10 P	9.9 U	12 P	12 P	23 DJP	9.9 U	13 P
4,4'-DDE	39	850 D	13	150	10	230	15	72	77	120	120	200 D	34	100
Aroclor-1254	130 U	2,800 D	46 J	420	43 J	760	53 JP	180	260	340	390	590 DP	120	260
Inorganic Parameters														
Aluminum	0.97 U	1.0 B	0.97 U	2.6 B	0.97 U	35.2	1.2 B	4.0 B	0.97 U	4.6 B	1.4 B	6 6 B	1.1 B	10.1
Arsenic	0.03 U	0.03 U	0.03 U	0.03 U	0.03 B	0.25 B	0.03 U	0.03 U	0 03 B	0 03 U	0.03 U	0 03 B	0.05 B	0 08 B
Barium	0.07 B	0.34 B	0.11 B	0.40 B	0.43 B	1.1 B	0.72 B	2.0 B	0.91 B	3.0 B	0 93 B	2.2 B	1.2 B	2.2 B
Calcium	1,090	2,530	2,650	2,100	3,820	2,100	6,280	15,400	4,110	13,600	4,240	12,400	4,470	11,100
Chromium	0.17 B	0.21 B	0.15 B	0.16 B	0.18 B	0.31 B	0.33 B	0.43	0.19 B	0.40 B	0.21 B	0 38 B	0.21 B	0.35 B
Cobalt	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0 11 U	0.11 U	0.11 U	0.11 U	0.11 U
Copper	0.88 B	1.4	0.33 B	1.4	0.43 B	1.5	0.53 B	0.53 B	1.0	1.5	1.0	1.1	1.4	1.5
Cyanide	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.89 B	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U
Iron	3.6 B	86.7	4.6	89.8	8.4	467	18.2	31.4	56.1	91.9	30.6	86.6	31.3	68.4
Lead	0.07 U	0.11 B	0.10 B	0.09 B	0.08 B	0.91	0.15	0.31	0.23	0.65	0.27	0 73	0.16	0.45
Magnesium	305	223	319	258	349	212	387	518	325	388	296	332	302	431
Manganese	0.16 B	1.2	0.20 B	1.1	0.97	4.2	1.5	3.7	1.6	5.3	2.2	5.0	2 0	4 4

See notes at end of table.

Table 4-6 (Continued)
Summary Analytical Results for Biota Samples at Lake Casa Linda

Sampling Event Report No. 17
Fisheries Investigation
NAS Jacksonville, Florida

Sample Designation	JAXCLB001		JAXCLB002		JAXCLB003		JAXCLB004		JAXCLB00501		JAXCLB00601		JAXCLB00701	
	Fillet	Liver/Gonad	Fillet	Liver/Gonad	Fillet	Liver/Gonad	Fillet	Carcass	Fillet	Carcass	Fillet	Carcass	Fillet	Carcass
Inorganic Parameters–continued														
Selenium	0.07 U	0.37	0.16 B	0.36	0.14 B	.31	0 07 U	0.13 B	0 07 U	0.22	0 07 U	0 2 B	0.22	0.18 B
Sodium	550	1,140	637	1,030	752	1,100	876	1020	1,050	1,330	979	1,270	830	1,080
Vanadium	0.11 U	0.11 U	0.11 U	0 11 U	0.11 U	0.30 B	0.11 U	0.11 U	0.11 U	0.11 U	0 11 U	0.11 U	0 11 U	0.12 B
Zinc	8.0	22.4	9.7	23.4	12.7	20.0	13 4	28 0	12.6	25 6	13 6	27 6	17.7	31 8

Notes: All concentrations reported as micrograms per liter ($\mu g/\ell$).
U = Compound not identified above detection limit, detection limit is listed.
J = Estimated concentration.
P = Indicates a pesticide analyte with a greater than 25 percent difference for detected concentrations between GC columns.
B = Reported concentration less than contract required detection limit (CRDL), but greater than or equal to instrument detection limit (IDL).
D = Diluted sample.
DDD = dichlorophenyl dichloroethane.
DDE = dichlorophenyl dichloroethane.

Table 4-7
Summary Analytical Results for Biota Samples at Lake Scotlis

Sampling Event Report No. 17
Fisheries Investigation
NAS Jacksonville, Florida

Sample Designation	JAXLSB001		JAXLSB002		JAXLSB003		JAXLSB004		JAXLSB005	
	Fillet	Carcass	Fillet	Carcass	Fillet	Carcass	Fillet	Carcass	Fillet	Carcass
Analytical Parameters										
Semivolatile Organics Compounds (SVOCs)										
bis(2-Ethylhexyl) phthalate	4,000 U	4,000 U	990 U	4,000 U	990 U	4,000 U	990 U	4,000 U	1,500 J	4,000 U
Di-n-butylphthalate	4,000 U	4,000 U	250 J	4,000 U	990 U	4,000 U	990 U	4,000 U	4,000 U	4,000 U
4-Methylphenol	690 J	4,000 U	990 U	4,000 U	990 U	4,000 U	990 U	4,000 U	4,000 U	4,000 U
Pesticides and Polychlorinated Biphenyls (PCBs)										
α-Chlordane	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	160 DP	150 DP
4,4'-DDD	9.9 U	9.9 U	9.9 U	9.9 U	9.9 U	9.9 U	9.9 U	14 U	99 U	99 U
4,4'-DDE	15	54	9.1 J	19	12	27	7.2 J	69	520 D	420 DP
Aroclor-1254	110	250	59 J	140	99 U	130	99 U	130	3,500 D	3,200 D
Inorganic Parameters										
Aluminum	0.97 U	3.1 B	0.97 U	9.1	11.8	12.5	8.8	15.0	12.8	4.1 B
Arsenic	0.03 U	0.03 U	0.03 U	0.03 B	0.03 U	0.03 U	0.03 U	0.03 U	0.06 B	0.04 B
Barium	0.10 B	0.63 B	0.11 B	0.56 B	0.61 B	1.8 B	0.78 B	1.3 B	0.78 B	0.45 B
Calcium	2,010	20,300	2,640	13,200	4,010	10,800	3,670	16,100	8,580	2,890
Chromium	0.21 B	0.52	0.18 B	0.39 B	0.22 B	0.33 B	0.14 B	0.48	0.33 B	0.19 B
Cobalt	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.15 B
Copper	0.33 B	1.0	0.33 B	1.1	0.60 B	0.24 B	0.55 B	0.12 B	1.3	1.0
Cyanide	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.28 B	0.14 U
Iron	4.8	13.6	4.9	18.5	9.5	20.3	8.5	32.5	36.4	19.4
Lead	0.12	0.99	0.17	2.0	0.42	1.4	0.42	2.1	1.5	0.52
Magnesium	306	585	308	486	312	407	284	529	304	282
Manganese	0.16 B	0.95	0.20 B	0.86	0.99	2.8	1.3	2.6	1.2	0.66
Mercury	0.21	0.06 B	0.07 B	0.05 B	0.03 U	0.04 B	0.06 B	0.07 B	0.06 B	0.03 U
Potassium	4,060	3,420	3,770	3,200	3,340	3,110	3,800	3,040	2790	3,400
Selenium	0.26	0.19 B	0.29	0.22	0.28	0.28	0.20	0.14 B	0.44	0.33
Sodium	779	1,210	799	1,070	845	932	869	1,090	999	737
Vanadium	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 B	0.11 B	0.11 U
Zinc	7.3	18.5	9.3	29.5	16.3	34.2	11.1	26.9	16.3	7.5

Notes: All concentrations reported as micrograms per liter (μg/ℓ).
U = Compound not identified above detection limit, detection limit is listed.
J = Estimated concentration.
P = Indicates a pesticide analyte with a greater than 25 percent difference for detected concentrations between GC columns.
B = Reported concentration less than contract required detection limit (CRDL), but greater than or equal to instrument detection limit (IDL).
D = Diluted samples.
DDD = dichlorophenyl dichloroethane.
DDE = dichlorophenyl dichloroethane.

4,4'-DDE was detected in each biota sample collected from Lake Scotlis and Lake Casa Linda. Concentrations of 4'4-DDE ranged from 9.1 J µg/ℓ to 850 D (diluted) µg/ℓ. A comparison of concentrations of 4,4'-DDE detected in fillet samples with carcass samples suggests that the carcass samples have higher concentrations than the fillet samples; however, there appears to be no correlation between the size and age groups of the fish and the concentration detected.

Concentrations of alpha-chlordane were detected in 7 of the 24 samples at concentrations ranging from 6.7 P µg/ℓ to 160 DP µg/ℓ. Alpha-chlordane was detected in biota samples from both Lake Scotlis and Lake Casa Linda. However, it should be noted that the alpha-chlordane concentrations were only detected in biota samples of the herbivorous trophic level. Three of the four age/size classifications for the herbivorous tropic level were reported to contain elevated concentrations of alpha-chlordane in both the fillet and carcass portions of the samples. The remaining sample JAXCLB005 was reported to contain elevated concentrations only in the fillet portion.

The pesticide compound 4,4'-DDD was detected in four of the samples at concentrations ranging from 12 P µg/ℓ to 30 JP µg/ℓ. However, all detected concentrations were reported with the data qualifier "P" indicating that the 4-4'-DDD had a greater than 25 percent difference in detected concentrations when run on separate gas chromatographs.

4.3.2.3 **PCB Compounds** Aroclor-1254 was detected in 21 of 24 biota samples analyzed. Detected concentrations ranged from 43 J µg/ℓ to 3,500 D µg/ℓ. Similar to the above, concentrations reported in the carcass or whole fish samples were consistently higher than the concentrations reported in the fillet samples.

4.3.2.4 **Inorganic Parameters** Thirteen inorganic parameters were detected at concentrations exceeding the CRDLs in biota samples collected at Lake Casa Linda and Lake Scotlis. The individual parameters detected above CRDLs are as follows: aluminum, calcium, chromium, copper, iron, lead, magnesium, manganese, mercury, potassium, selenium, sodium, and zinc. All of the samples contained five or more of these detected parameters. There does not appear to be a correlation between the trophic levels and number of inorganic parameters detected or the concentrations of inorganics detected; nor does there appear to be a correlation between metals detected or concentrations of metals within fillet samples versus the whole carcass or liver and gonad samples.

5.0 SUMMARY

The following summarizes the findings of this investigation.

- The surface water samples collected from the three surface water bodies were reported to contain 18 inorganic compounds. Thirteen of the compounds were reported at concentrations exceeding CRDLs. No VOCs, SVOCs, or pesticides and PCB compounds were detected above the CRDLs.

- Three inorganic analytes, copper, iron, and mercury, were detected in surface water samples from Lake Casa Linda and Lake Scotlis at concentrations exceeding the FSWQC guideline concentrations.

- Six inorganic analytes, aluminum, arsenic, cadmium, cyanide, iron, and nickel, were detected in surface water samples from the Polishing Pond at concentrations exceeding the Federal AWQC or FSWQC guideline concentrations.

- Sediment samples collected at Lake Casa Linda and Lake Scotlis indicate the presence of 1 VOC, 13 SVOCs, 5 pesticide compounds, and 13 inorganic compounds. Sediment samples recovered from the Polishing Pond were reported to contain 4 VOCs, 2 SVOCs, 2 pesticide and PCB compounds, and 18 inorganic compounds.

- Sediment samples recovered from Lake Casa Linda were reported to contain four SVOCs (chrysene, fluoranthene, phenanthrene, and pyrene), two pesticide compounds (4,4'-DDD and 4-4'-DDE), one PCB compound (Aroclor-1254), and five inorganic compounds (cadmium, copper, lead, mercury, and zinc) at concentrations exceeding the NOAA sediment ER-L guidelines.

- Sediment samples recovered from Lake Scotlis were reported to contain two pesticide compounds are PCB (4,4'-DDD, 4,4'-DDE) (Aroclor-1254), and three inorganic compounds (copper, lead, and zinc) at concentrations exceeding the NOAA sediment ER-L guidelines.

- Sediment samples recovered from the Polishing Pond contained seven inorganic parameters including cadmium, chromium, lead, mercury, nickel, silver, and zinc at concentrations exceeding the NOAA sediment ER-L guidelines.

- Detectable concentrations of 4,4-DDE were reported in every biota sample, including all age and size groups of all three tropic levels, collected in Lake Casa Linda and Lake Scotlis. In every case except one, the carcass portion of the samples reported higher concentrations of this parameter than the fillet portion of the samples.

- The PCB compound Aroclor-1254 was detected in 21 of the 25 fillet and carcass biota samples analyzed. The highest concentrations of this compound were detected in the larger herbivorous trophic class (specifically the gizzard shad) collected at Lake Casa Linda.

- Thirteen inorganic parameters were detected above the CRDLs in biota samples collected from Lake Casa Linda and Lake Scotlis. Each sample collected reported five or more of the parameters.

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APPENDIX A

SAMPLING AND ANALYSIS PLAN

P-159, UST, AND P-3 PAD
SAMPLING AND ANALYSIS PLAN

NAVAL AIR STATION
JACKSONVILLE, FLORIDA

Contract No. N62467-89-D-0317
Contract Task Order No. 075

Prepared by:

ABB Environmental Services, Inc.
2590 Executive Center Circle, East
Berkeley Building
Tallahassee, Florida 32301

Prepared for:

Department of the Navy, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive, P.O. Box 10068
Charleston, South Carolina 29411-0068

Joel Murphy, Code 1853, Remedial Program Manager

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Sampling and Analysis Plan

1.0 INTRODUCTION

In accordance with the Statement of Work (SOW) and Contract Task Order No. 075, ABB Environmental Services, Inc. (ABB-ES), has prepared a Sampling and Analysis Plan (SAP) for conducting an investigation at Installation Restoration (IR) Potential Source of Contamination (PSC) in P-159, P-3 Pad, and UST work at Naval Air Station (NAS) Jacksonville. Current construction plans for NAS Jacksonville call for the construction/ renovation of wash and rinse stations for helicopters (Site P-159) and the removal of underground storage tanks adjacent to Building 101 (Site UST). This investigation will identify potential contamination of these sites prior to construction and excavation activities. In addition, previous construction activities at the P-3 engine test cell area extension resulted in transporting and stockpiling of excavated soils to an off-base location. These stockpiles will be evaluated for possible contamination. And, finally, three on-base surface water bodies will be investigated for possible contamination of surface water, sediment, and biota.

For ease of presentation and understanding, the following site designations will be utilized throughout this document and any subsequent reports.

- The helicopter wash/rinse racks will be referred to as Site P-159.
- The underground storage tanks surrounding Building 101 will be referred to as Site UST.
- The soil piles resulting from excavations at the P-3 engine test cell area extension will be referred to as Site P-3 Pad (the samples taken at the soil piles will be differentiated, within the text, from the one sample taken at the actual P-3 engine test cell area extension.
- The electrofishing and surface water/sediment sampling efforts will be referred to as one of the three actual names where this effort is to be done.

1.1 SITE LOCATIONS AND DESCRIPTIONS. Two of the three sites, P-159 and UST, are located in the Naval Aviation Depot (NADEP) at NAS Jacksonville (Figure 1-1). NADEP is within the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Operable Unit (OU) 3, The Industrial Area. The three surface water bodies to be investigated include: Lake Casa Linda and Lake Scotlis (both located within the boundaries of the on-base golf course), and the polishing pond located northeast of the waste water treatment plant in OU2. The P-3 engine test cell area extension is located within PSC 8 approximately ½ mile north of the P-159 site area, and the off-base soil piles (Site P-3 Pad) are located approximately 8 miles west of NAS Jacksonville off Brannon Field Road in Duval County, Florida.

Construction plans for Site P-159 consist of one proposed helicopter rinse facility, one proposed helicopter wash rack, and modification to one existing helicopter wash rack. The proposed helicopter wash and rinse racks are located at the helicopter flight line south of Albermarle Avenue and west of the St. Johns River. The existing wash rack facility is located approximately 20 feet north of Building 190.

The UST site includes nine buried underground storage tanks located in three separate areas along the perimeter of Building 101. The areas are as follows: a group of five USTs (designated tanks 101-BS1 through 101-BS5) located in the northeast alcove of Building 101; a single UST (designated Tank 101-CS) located on the east of Building 101, between the building and Wright Street; and a group of three USTs located in a southwest alcove of Building 101.

Site P-3 Pad is reported to consist of four soil piles. The soil was excavated from within the area defined as PSC 8 during construction of the P-3 engine test cell area and transported to a gravel pit located in an undeveloped area off Brannon Field Road.

1.2 PURPOSE. The objective of this SAP is to present the field exploration and analytical scope of work that will be used to evaluate the presence, magnitude, and characteristics of hazardous substances, if any, at Sites P-159, UST, P-3 Pad, and the individual lakes to be electroshocked that may pose a threat to human health or the environment.

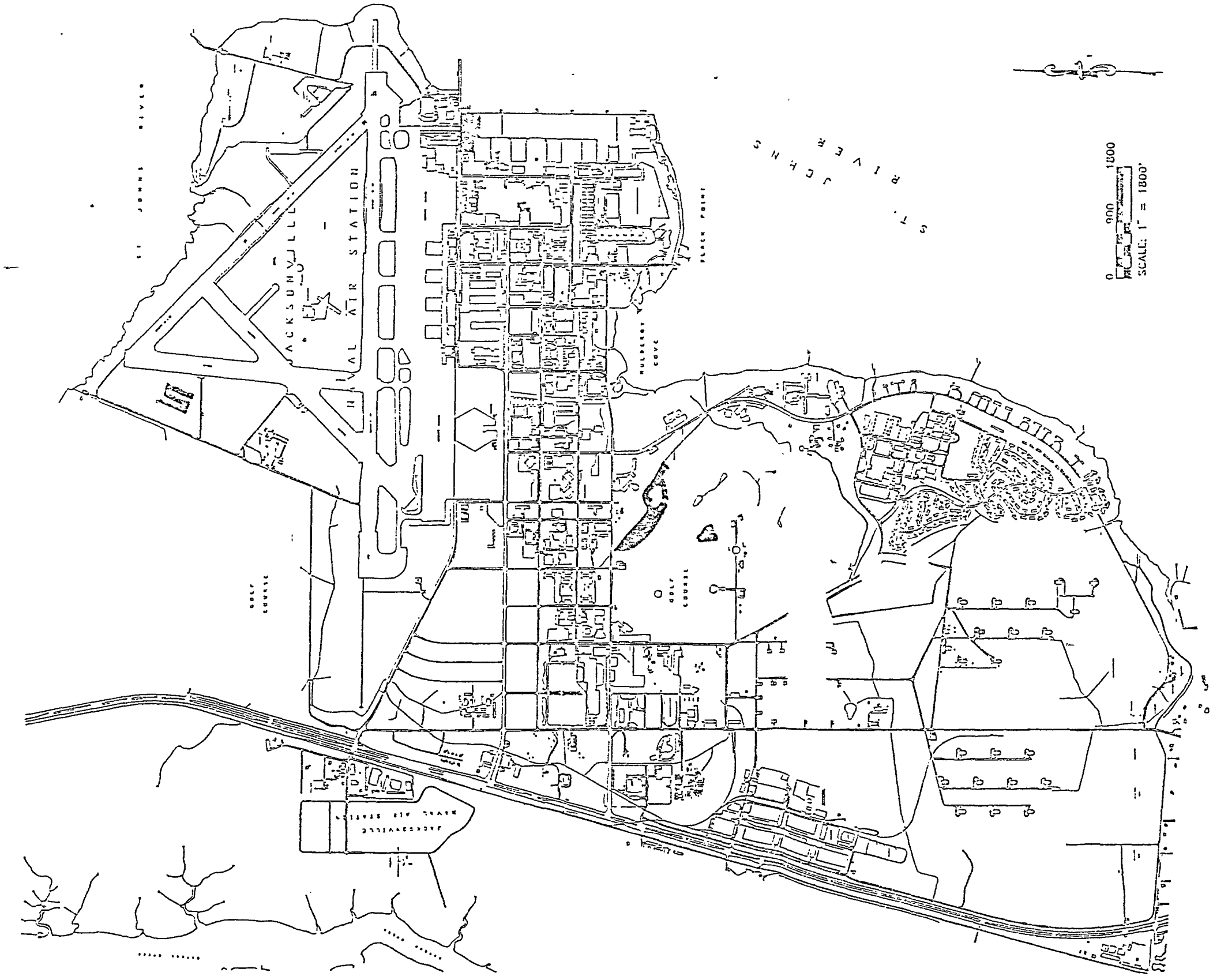


FIGURE 1-1
SITE LOCATIONS MAP

P-159, UST AND P-3 PAD SAMPLING AND ANALYSIS PLAN

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

2.0 SCOPE OF WORK

The proposed field investigations to be conducted to satisfy the SOW will include subsurface soil sampling, shallow groundwater sampling, surface water and sediment sampling, electrofishing sample collection, laboratory analysis, aquifer testing, and a sample location survey. Soil samples will be collected at the P-159, UST, and P-3 pad sites. Groundwater samples will be collected at the P-159 and UST sites. Electrofishing, surface water, and sediment sampling will be completed at Lake Casa Linda, Lake Scotlis, and the polishing pond. Details concerning Quality Control (QC) procedures, Data Quality Objectives (DQOs), and sampling and decontamination procedures are provided in the Navy Installation Restoration Program (NIRP) Naval Air Station Jacksonville, Florida, Volume 5, specifically Appendix 5.4.1, OU1 Quality Assurance Project Plan (QAPP) and Appendix 5.4.2, OU1 Field Sampling Plan.

2.1 PRELIMINARY ACTIVITIES. On August 28, 1992, representatives from ABB-ES visited Sites P-159 and UST, marked the proposed soil boring and monitoring well locations, and made general observations concerning the sites. Based on this site visit and discussions with the Southern Division's Remedial Program Manager (RPM), a Plan of Action (POA) for the sites was developed. The POA formed the basis for this SAP.

2.2 SAMPLE IDENTIFICATION. Identification for each sample collected at the sites will consist of up to a five-part sample designation system. The representative sample designation, the criteria for the individual portions of the designation, and designation order is as follows:

JAX-P-159-SB01-1-3-01D

1. JAX designates the installation code for NAS Jacksonville.

2. P-159 designates the site number (P-159 designates Site P-159; B101 designates Site UST; P003 designates Site P-3 Pad; PP designates the polishing pond; CL designates Lake Casa Linda; and LS designates Lake Scotlis).

3. SB01 designates the sample type and number (SB for soil boring, GW for groundwater, BO for biota, SW for surface water, SD for sediment, FB for field blank, RB for rinsate blank, and TB for trip blank).

4. 1-3 designates the sample vertical (depth) locator or media (1 to 3 feet for depth, FT for Biota Fillet, and LG for Biota Liver and Gonads).

5. 01 is the sample event number (the letter represents a possible suffix to the event number for a field QC sample; A represents a duplicate sample; MS represents matrix spike; and MSD represents matrix spike duplicates).

2.3 SOIL SAMPLING. A total of 58 soil samples will be collected from 29 soil borings located at Sites P-159 and UST (see Figure 2-1). At each soil boring location, two soil samples will be collected for laboratory analysis as follows:

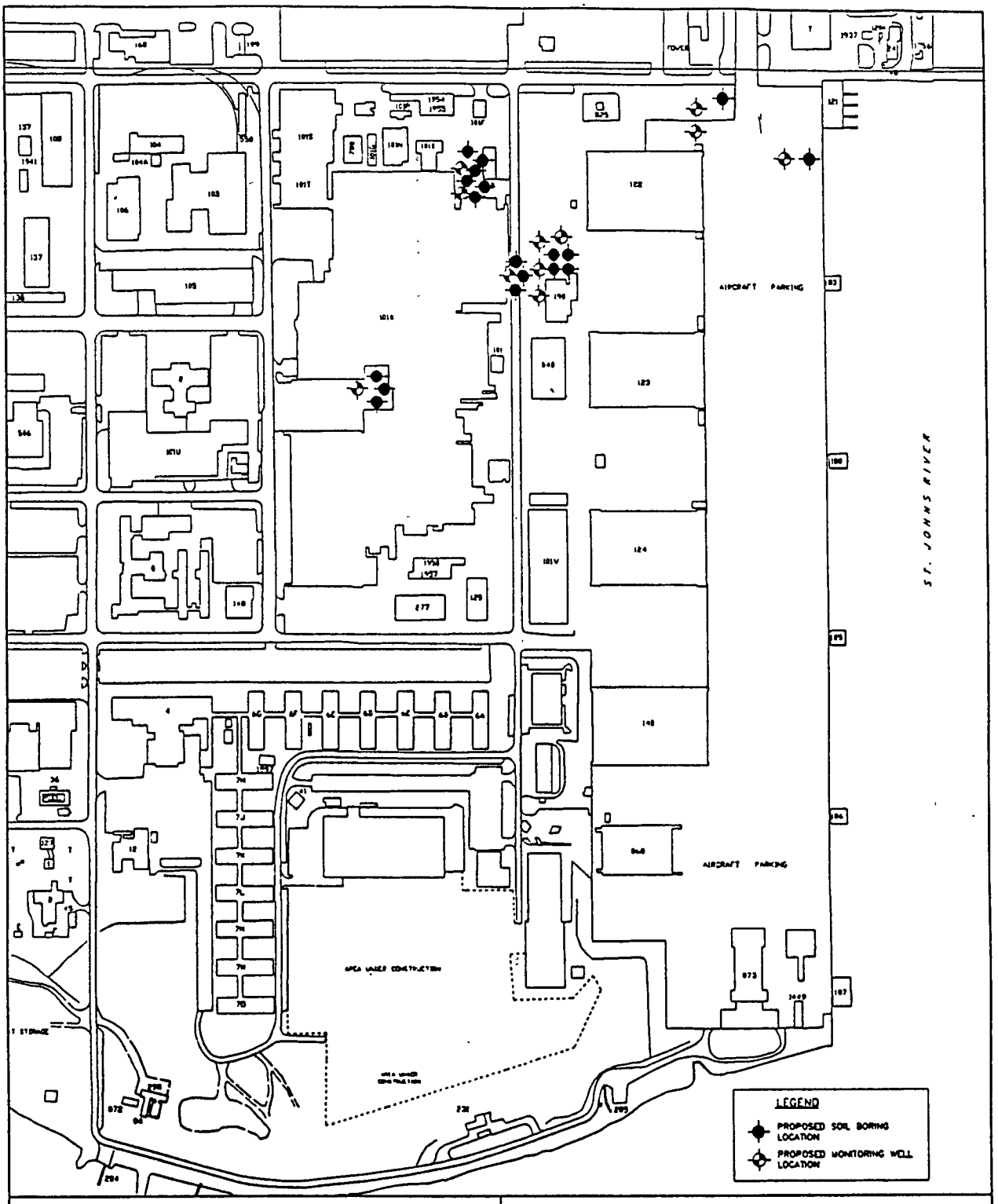


FIGURE 2-1
P-159 AND UST SITES
PROPOSED SOIL BORING AND
MONITORING WELL LOCATIONS

P-159, UST AND P-3
SAMPLING AND ANALYSIS
PLAN

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

(1) soil samples collected from below the concrete or asphalt pavement to a depth of 3 feet below land surface (bls) will be composited into one sample, and (2) a sample collected from 5 to 6 feet bls, which is anticipated to be immediately above the water table. In the event groundwater is encountered prior to the second sampling depth, the second soil sample will not be recovered.

To collect the samples, any concrete or asphalt pavement and gravel base will be removed from each sample location. Shallow soil samples will then be collected using a stainless-steel bucket auger. After collection of the shallow soil sample, the same bucket auger will be used to advance the borehole to the proposed second sampling depth. A separate, decontaminated stainless-steel hand auger will be used to collect the second sample.

Soil samples for target compound list (TCL) volatile organic compound (VOC) analysis will be transferred directly from the sampling tool to the appropriate containers. The soil for the remaining sample fractions will be thoroughly mixed with a stainless-steel spoon in a decontaminated Pyrex™ glass bowl. The sample will then be transferred to the appropriate sample containers.

Following soil boring activities at the P-159 and UST sites, each of the soil boring locations will be surveyed relative to horizontal x and y coordinates by a Florida-registered surveyor. These horizontal coordinates will be referenced to the transverse Merc East Zone and converted to the North American Datum of 1983.

In addition to soil sampling at Sites P-159 and UST, surface soil samples will be collected from the P-3 Pad site. A total of four soil samples (0 to 2 feet deep) will be collected from the soil piles using a stainless-steel hand auger. A single soil sample will also be collected from the P-3 engine test cell extension area, which is the original source area for the soil piles. The sample will be collected from immediately below the concrete or asphalt pavement to a depth of 3 feet using a stainless-steel hand auger.

Soil samples collected from Sites P-159 and UST will be analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), TCL semivolatile organic compounds (SVOCs), and TCL polychlorinated biphenyls (PCBs) and pesticides, and Target Analyte List (TAL) inorganics, including cyanide. Table 2-1 and 2-2 provide summaries of the soil samples to be collected and analyses to be performed. The samples will be analyzed on an accelerated 14-day completion period. The results of the analysis will be used to identify samples containing contaminant concentrations that exceed either the applicable or relevant and appropriate requirements (ARARs) compiled in the *Handbook of Applicable or Relevant and Appropriate Requirements for Navy CLEAN Sites Within the State of Florida* or criteria established for Toxic Characteristic Leaching Procedure (TCLP). TCLP extracts will be analyzed for TCLP listed metals, volatiles, and solvents on samples containing target analytes that exceed either ARAR.

The soil samples collected in association with Site P-3 Pad will be extracted by Toxicity Characteristic Leachate Procedure (TCLP) and analyzed for VOCs, SVOCs, pesticides and PCBs, and metals. In addition, total petroleum hydrocarbon (TPH) analysis will be performed. Tables 2-1, Sample Collection Matrix, and Table 2-2, Analytical Method Summary, provide a summary of the sample designations laboratory analyses to be completed.

Table 2-1
Sample Collection Matrix

NAS Jacksonville
Sites P-159, UST, and P-3 Pad
Jacksonville, Florida

Sample Location/ID	Media	TCL VOC	TCL SVOC	TCL Pesticides and PCBs	TAL Inorganics[1]	TCLP[2]
P-159SB01 1-3	Soil	1	1	1	1	0
P-159SB01 5-6	Soil	1	1	1	1	0
P-159SB02 1-3	Soil	1	1	1	1	0
P-159SB02 5-6	Soil	1	1	1	1	0
P-159SB03 1-3	Soil	1	1	1	1	0
P-159SB03 5-6	Soil	1	1	1	1	0
P-159SB04 1-3	Soil	1	1	1	1	0
P-159SB04 5-6	Soil	1	1	1	1	0
P-159SB05 1-3	Soil	1	1	1	1	0
P-159SB05 5-6	Soil	1	1	1	1	0
P-159SB06 1-3	Soil	1	1	1	1	0
P-159SB06 5-6	Soil	1	1	1	1	0
P-159SB07 1-3	Soil	1	1	1	1	0
P-159SB07 5-6	Soil	1	1	1	1	0
P-159SB08 1-3	Soil	1	1	1	1	0
P-159SB08 5-6	Soil	1	1	1	1	0
P-159SB09 1-3	Soil	1	1	1	1	0
P-159SB09 5-6	Soil	1	1	1	1	0
P-159SB10 1-3	Soil	1	1	1	1	0
P-159SB10 5-6	Soil	1	1	1	1	0
P-159SB11 1-3	Soil	1	1	1	1	0
P-159SB11 5-6	Soil	1	1	1	1	0
P-159SB12 1-3	Soil	1	1	1	1	0
P-159SB12 5-6	Soil	1	1	1	1	0
P-159SB13 1-3	Soil	1	1	1	1	0
P-159SB13 5-6	Soil	1	1	1	1	0
Subtotal		26	26	26	26	[3]6
P-159GW01	Groundwater	1	1	1	1	0
P-159GW02	Groundwater	1	1	1	1	0
P-159GW03	Groundwater	1	1	1	1	0
P-159GW04	Groundwater	1	1	1	1	0
P-159GW05	Groundwater	1	1	1	1	0
P-159GW06	Groundwater	1	1	1	1	0
P-159GW07	Groundwater	1	1	1	1	0
Subtotal		7	7	7	7	0
B101SB01 1-3	Soil	1	1	1	1	0
B101SB01 5-6	Soil	1	1	1	1	0
B101SB02 1-3	Soil	1	1	1	1	0
B101SB02 5-6	Soil	1	1	1	1	0
B101SB03 1-3	Soil	1	1	1	1	0
B101SB03 5-6	Soil	1	1	1	1	0

See notes at end of table.

Table 2-1 (Continued)
Sample Collection Matrix

NAS Jacksonville
Sites P-159, UST, and P-3 Pad
Jacksonville, Florida

Sample Location/ID	Media	TCL VOC	TCL SVOC	TCL Pesticides and PCBs	TAL Inorganics[1]	TCLP[2]
B101SB04 1-3	Soil	1	1	1	1	0
B101SB04 5-6	Soil	1	1	1	1	0
B101SB05 1-3	Soil	1	1	1	1	0
B101SB05 5-6	Soil	1	1	1	1	0
B101SB06 1-3	Soil	1	1	1	1	0
B101SB06 5-6	Soil	1	1	1	1	0
B101SB07 1-3	Soil	1	1	1	1	0
B101SB07 5-6	Soil	1	1	1	1	0
B101SB08 1-3	Soil	1	1	1	1	0
B101SB08 5-6	Soil	1	1	1	1	0
B101SB09 1-3	Soil	1	1	1	1	0
B101SB09 5-6	Soil	1	1	1	1	0
B101SB10 1-3	Soil	1	1	1	1	0
B101SB10 5-6	Soil	1	1	1	1	0
B101SB11 1-3	Soil	1	1	1	1	0
B101SB11 5-6	Soil	1	1	1	1	0
B101SB12 1-3	Soil	1	1	1	1	0
B101SB12 5-6	Soil	1	1	1	1	0
B101SB13 1-3	Soil	1	1	1	1	0
B101SB13 5-6	Soil	1	1	1	1	0
B101SB14 1-3	Soil	1	1	1	1	0
B101SB14 5-6	Soil	1	1	1	1	0
B101SB15 1-3	Soil	1	1	1	1	0
B101SB15 5-6	Soil	1	1	1	1	0
B101SB16 1-3	Soil	1	1	1	1	0
B101SB16 5-6	Soil	1	1	1	1	0
Subtotal		32	32	32	32	[3]7
B101GW01	Groundwater	1	1	1	1	0
B101GW02	Groundwater	1	1	1	1	0
B101GW03	Groundwater	1	1	1	1	0
B101GW04	Groundwater	1	1	1	1	0
Subtotal		4	4	4	4	0
P003SB01	Soil	0	0	0	0	[4]1
P003SB02	Soil	0	0	0	0	[4]1
P003SB03	Soil	0	0	0	0	[4]1
P003SB04	Soil	0	0	0	0	[4]1
P003SB05	Soil	0	0	0	0	[4]1
Subtotal		0	0	0	0	[4]5

See notes at end of table.

Table 2-1 (Continued)
Sample Collection Matrix

NAS Jacksonville
Sites P-159, UST, and P-3 Pad
Jacksonville, Florida

Sample Location/ID	Media	TCL VOC	TCL SVOC	TCL Pesticides and PCBs	TAL Inorganics[1]	TCLP[2]
LSB001 FT	Biota	0	1	1	1	0
LSB001 LG	Biota	0	1	1	1	0
LSB002 FT	Biota	0	1	1	1	0
LSB002 LG	Biota	0	1	1	1	0
LSB003 FT	Biota	0	1	1	1	0
LSB003 LG	Biota	0	1	1	1	0
LSB004 FT	Biota	0	1	1	1	0
LSB004 LG	Biota	0	1	1	1	0
LSB005 FT	Biota	0	1	1	1	0
LSB005 LG	Biota	0	1	1	1	0
LSB006 FT	Biota	0	1	1	1	0
LSB006 LG	Biota	0	1	1	1	0
LSB007 FT	Biota	0	1	1	1	0
LSB007 LG	Biota	0	1	1	1	0
LSB008 FT	Biota	0	1	1	1	0
LSB008 LG	Biota	0	1	1	1	0
LSB009 FT	Biota	0	1	1	1	0
LSB009 LG	Biota	0	1	1	1	0
CLB001 FT	Biota	0	1	1	1	0
CLB001 LG	Biota	0	1	1	1	0
CLB002 FT	Biota	0	1	1	1	0
CLB002 LG	Biota	0	1	1	1	0
CLB003 FT	Biota	0	1	1	1	0
CLB003 LG	Biota	0	1	1	1	0
CLB004 FT	Biota	0	1	1	1	0
CLB004 LG	Biota	0	1	1	1	0
CLB005 FT	Biota	0	1	1	1	0
CLB005 LG	Biota	0	1	1	1	0
CLB006 FT	Biota	0	1	1	1	0
CLB006 LG	Biota	0	1	1	1	0
CLB007 FT	Biota	0	1	1	1	0
CLB007 LG	Biota	0	1	1	1	0
CLB008 FT	Biota	0	1	1	1	0
CLB008 LG	Biota	0	1	1	1	0
CLB009 FT	Biota	0	1	1	1	0
CLB009 LG	Biota	0	1	1	1	0
PPB001 FT	Biota	0	1	1	1	0
PPB001 LG	Biota	0	1	1	1	0
PPB002 FT	Biota	0	1	1	1	0
PPB002 LG	Biota	0	1	1	1	0
PPB003 FT	Biota	0	1	1	1	0
PPB003 LG	Biota	0	1	1	1	0

See notes at end of table.

Table 2-1 (continued)
Sample Collection Matrix

NAS Jacksonville
Sites P-159, Building 101-USTs, and P-3 Soil Piles
Jacksonville, Florida

Sample Location/ID	Media	TCL VOC	TCL SVOC	TCL Pesticides and PCBs	TAL Inorganics[1]	TCLP[2]
PPB004 FT	Biota	0	1	1	1	0
PPB004 LG	Biota	0	1	1	1	0
PPB005 FT	Biota	0	1	1	1	0
PPB005 LG	Biota	0	1	1	1	0
PPB006 FT	Biota	0	1	1	1	0
PPB006 LG	Biota	0	1	1	1	0
PPB007 FT	Biota	0	1	1	1	0
PPB007 LG	Biota	0	1	1	1	0
PPB008 FT	Biota	0	1	1	1	0
PPB008 LG	Biota	0	1	1	1	0
PPB009 FT	Biota	0	1	1	1	0
PPB009 LG	Biota	0	1	1	1	0
Subtotal		0	54	54	54	0
LS-SD01 0-6	Sediment	1	1	1	1	0
LS-SD02 0-6	Sediment	1	1	1	1	0
LS-SD03 0-6	Sediment	1	1	1	1	0
CL-SD01 0-6	Sediment	1	1	1	1	0
CL-SD02 0-6	Sediment	1	1	1	1	0
CL-SD03 0-6	Sediment	1	1	1	1	0
PP-SD01 0-6	Sediment	1	1	1	1	0
PP-SD02 0-6	Sediment	1	1	1	1	0
PP-SD03 0-6	Sediment	1	1	1	1	0
Subtotal		9	9	9	9	0
LS-SW01	Surface Water	1	1	1	1	0
LS-SW02	Surface Water	1	1	1	1	0
LS-SW03	Surface Water	1	1	1	1	0
CL-SW01	Surface Water	1	1	1	1	0
CL-SW02	Surface Water	1	1	1	1	0
CL-SW03	Surface Water	1	1	1	1	0
PP-SW01	Surface Water	1	1	1	1	0
PP-SW02	Surface Water	1	1	1	1	0
PP-SW03	Surface Water	1	1	1	1	0
Subtotal		9	9	9	9	0
Total Soil Samples		58	58	58	58	18
Total Groundwater Samples		11	11	11	11	0
Total Sediment Samples		9	9	9	9	0
Total Surface Water Samples		9	9	9	9	0
Total Biota Samples		0	54	54	54	0
Total Environmental Samples		87	141	141	141	18

See notes at end of table.

Table 2-1 (Continued)
Sample Collection Matrix

NAS Jacksonville
Sites P-159, UST, and P-3 Pad
Jacksonville, Florida

Sample Location/ID	Media	TCL VOC	TCL SVOC	TCL Pesticides and PCBs	TAL Inorganics[1]	TCLP[2]
QA/QC Samples						
Equipment Blanks	Water	16	16	16	16	0
Field Blanks	Water	3	3	3	3	0
Trip Blanks	Water	0	12	0	0	0
Field Duplicates	Soil	7	7	7	7	0
Field Duplicates	Water	3	3	3	3	0
MS/MSD	Soil	4/4	4/4	4/4	4/4	0
MS/MSD	Water	3/3	3/3	3/3	3/3	0
Total QA/QC Samples		43	55	43	43	0
Total Soil Samples		82	82	82	82	18
Total Water Samples		48	60	48	48	0

[1]Metals (Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, As, Na, Tl, W, Zn plus total cyanide).
[2]Includes TCLP extract and extract analysis for volatiles, solvents, and metals; individual samples will be run based on results of TCL analysis.
[3]Estimate that 20 percent of soil samples will receive TCLP extraction and analyses.
[4]Includes TCLP extraction and extract analysis for VOCs, SVOCs, pesticides and PCBs, metals, and solvents; plus total petroleum hydrocarbons.

Notes: All sample designations have a JAX prefix.
TCL = target compound list.
SVOC = semivolatile organic compounds.
VOC = volatile organic compounds.
PCBs = polychlorinated biphenyls.
TAL = target analyte list.
TCLP = toxicity characteristic leaching procedure.
MS/MSD = matrix spike/matrix spike duplicates.
QA/QC = quality assurance/quality control.
GC = gas chromatograph.

Table 2-2
Analytical Method Summary

NAS Jacksonville
Sites P-159, UST, and P-3 Pad
Jacksonville, Florida

Parameter/Analytes	Matrix	Number of Samples	Analytical Method	NEESA QC Level
(1) Target Compound List				
a. Volatile Organic Compounds	Soil	82	8240 CLP	C
	Water	60	8240 CLP	C
b. Semivolatile Organic Compounds	Soil	82	8270 CLP	C
	Water	48	8270 CLP	C
	Biota	54	8270 CLP	C
c. Chlorinated Pesticides & PCBs	Soil	82	8080 CLP	C
	Water	48	8080 CLP	C
	Biota	54	8080 CLP	C
(2) Target Analyte List				
a. Total Cyanide	Soil	82	335.2 CLP	C
	Water	48	335.2 CLP	C
	Biota	54	335.2 CLP	C
b. Metals				
Aluminum (Al)	Soil	82	200.7 CLP	C
	Water	48	200.7 CLP	C
	Biota	54	6010 CLP	C
Antimony (Sb)	Soil	82	200.7 CLP	C
	Water	48	200.7 CLP	C
	Biota	54	6010 CLP	C
Arsenic (As)	Soil	82	206.2 CLP	C
	Water	46	206.2 CLP	C
	Biota	54	6010 CLP	C
Barium (Ba)	Soil	82	200.7 CLP	C
	Water	46	200.7 CLP	C
	Biota	54	6010 CLP	C
Beryllium (Be)	Soil	82	200.7 CLP	C
	Water	48	200.7 CLP	C
	Biota	54	6010 CLP	C
Cadmium (Cd)	Soil	82	200.7 CLP	C
	Water	48	200.7 CLP	C
	Biota	54	6010 CLP	C
Calcium (Ca)	Soil	82	200.7 CLP	C
	Water	48	200.7 CLP	C
	Biota	54	6010 CLP	C
Total Chromium (Cr)	Soil	82	200.7 CLP	C
	Water	48	200.7 CLP	C
	Biota	54	6010 CLP	C
Cobalt (Co)	Soil	82	200.7 CLP	C
	Water	48	200.7 CLP	C
	Biota	54	6010 CLP	C

See notes at end of table.

Table 2-2 (Continued)
Analytical Method Summary

NAS Jacksonville
Sites P-159, UST, and P-3 Pad
Jacksonville, Florida

Parameter/Analytes	Matrix	Number of Samples	Analytical Method	NEESA QC Level
Copper (Cu)	Soil	82	200.7 CLP	C
	Water	48	200.7 CLP	C
	Biota	54	6010 CLP	C
Iron (Fe)	Soil	82	200.7 CLP	C
	Water	48	200.7 CLP	C
	Biota	54	6010 CLP	C
Lead (Pb)	Soil	82	239.2 CLP	C
	Water	48	239.2 CLP	C
	Biota	54	6010 CLP	C
Magnesium (Mg)	Soil	82	200.7 CLP	C
	Water	48	200.7 CLP	C
	Biota	54	6010 CLP	C
Manganese (Mn)	Soil	82	200.7 CLP	C
	Water	48	200.7 CLP	C
	Biota	54	6010 CLP	C
Mercury (Hg)	Soil	82	245.1 CLP	C
	Water	48	245.5 CLP	C
	Biota	54	6010 CLP	C
Nickel (Ni)	Soil	82	200.7 CLP	C
	Water	48	200.7 CLP	C
	Biota	54	6010 CLP	C
Potassium (K)	Soil	82	200.7 CLP	C
	Water	48	200.7 CLP	C
	Biota	54	6010 CLP	C
Selenium (Se)	Soil	82	200.7 CLP	C
	Water	48	200.7 CLP	C
	Biota	54	6010 CLP	C
Silver (Ag)	Soil	82	200.7 CLP	C
	Water	48	200.7 CLP	C
	Biota	54	6010 CLP	C
Sodium (Na)	Soil	82	200.7 CLP	C
	Water	48	200.7 CLP	C
	Biota	54	6010 CLP	C

See notes at end of table.

Table 2-2 (Continued)
Analytical Method Summary

NAS Jacksonville
Sites P-159, UST, and P-3 Pad
Jacksonville, Florida

Parameter/Analytes	Matrix	Number of Samples	Analytical Method	NEESA QC Level
(2) Target Analyte List (continued)				
b. Metals (continued)				
Thallium (Tl)	Soil	82	279.2 CLP	C
	Water	48	279.2 CLP	C
	Biota	54	6010 CLP	C
Vanadium (V)	Soil	82	200.7 CLP	C
	Water	48	200.7 CLP	C
	Biota	54	6010 CLP	C
Zinc (Zn)	Soil	82	200.7 CLP	C
	Water	48	200.7 CLP	C
	Biota	54	6010 CLP	C
(3) Toxic Characteristics Leaching Procedures (TCLP)				
a. Extraction	Soil	21	SW846-1311	E
b. VOCs, Regulated	Extract	21	SW846-8240	E
c. SVOCs, Regulated	Extract	5	SW846-8270	E
d. Pesticides	Extract	5	SW846-8080	E
e. Metals, Regulated				
Arsenic	Extract	21	SW846-7060	E
Barium	Extract	21	SW846-6010	E
Cadmium	Extract	21	SW846-6010	E
Chromium	Extract	21	SW846-6010	E
Lead	Extract	21	SW846-7421	E
Mercury	Extract	21	SW846-7470	E
Selenium	Extract	21	SW846-7740	E
Silver	Extract	21	SW846-6010	E
(4) Land Disposal Restricted Solvents (F001-F005)	Extract	21	SW846-8010 SW846-8020	E
(5) Total recoverable hydrocarbons	Soil	5	Internal	E

Notes: NEESA = Naval Energy and Environmental Support Activity.
QC = quality control.
CLP = U.S. Environmental Protect Agency Contract Laboratory Program.
PCBs = polychlorinated biphenyls.
VOCs = volatile organic chemicals.
SVOCs = semivolatile organic chemicals.

The specific analytes and objectives are the same as those listed in the OU1 Quality Assurance Project Plan (QAPP) in Appendix 5.4 of Volume 5 of the U.S. Environmental Protection (USEPA) approved Work Plan. All samples, except those collected for TCLP analysis, will be analyzed and reported in accordance with Naval Energy and Environmental Support Activity (NEESA) Level C DQOs. Analytical findings will be validated in accordance with Naval Energy and Environmental Support Act (NEESA) Level C requirements. Samples collected for TCLP extraction and subsequent analysis will be reported in accordance with NEESA Level E DQOs.

2.4 MONITORING WELL INSTALLATION. In conjunction with the subsurface soil sampling activities, shallow water table monitoring wells will be installed at 11 of the soil sampling locations (see Figure 2-1). Following collection of the subsurface soil samples (Section 2.3, Soil Sampling), a rotary drill rig will be set up over the borehole and a split-spoon sampler will be driven to collect continuous samples (at 2-foot intervals) from a depth of 6 feet to 20 feet bls. The split-spoon samples will be described by an onsite geologist to document the lithologic conditions of each borehole. Following the split spoon sampling operation, the hollow stem augers will be raised to approximately 15 feet bls and the lower borehole will be allowed to collapse. A determination of static water level will be made and a 2-inch diameter Schedule 40 polyvinyl chloride (PVC) monitoring well will be installed. The PVC well will be constructed of 10 feet of 0.010-inch slotted well screen and will bracket the top of the water table. Surface completions of each well will be of a flush mount type designed for maximum weight bearing capacity. Well completion will include proper well development and containerization of all drill cuttings and development water. The procedure for well development is provided in the NIRP Program Plan, Volume 4, Basic Site Work Plan, Section 3.2.4.2.

2.5 GROUNDWATER SAMPLING. After the monitoring wells have been developed and allowed to equilibrate for a minimum of 24 hours, they will be purged and sampled using a decontaminated Teflon™ bailer. Prior to sampling, between three and five well volumes of groundwater will be purged from each well so as to obtain a groundwater sample representative of the screened interval zone.

During purging activities, field parameters including pH, specific conductance, and temperature will be monitored following removal of each well volume. If three consecutive field parameter measurements are found to be within 5 percent of each measurement, purging activities will be discontinued and the sample will be collected. To avoid over-purging the well, no more than five well volumes will be removed even if field parameter stabilization has not been obtained. Following well purging activities, a Teflon™ bailer will be used to collect the groundwater sample for laboratory analysis.

All groundwater samples will be analyzed for TCL VOCs, SVOCs, pesticides and PCBs, and for TAL inorganics including cyanide. Specific analytes and objectives are the same as those listed in the OU1 QAPP in Appendix 5.4 of Volume 5 of the Work Plan. Tables 2-1 and 2-2 provide a summary of sample designations and laboratory analyses to be completed. Analytical findings will be reported and validated in accordance with NEESA Level C requirements.

2.6 HYDROGEOLOGIC ASSESSMENT. As part of the Sites P-159 and UST investigation, a limited hydrogeologic investigation will be conducted. The hydrogeologic investigation will include: a survey of well head elevations, measurements of

depth-to-water, and completion of rising head "slug" tests in each of the monitoring wells.

Following monitoring well installation activities, the top of casings of all newly installed monitoring wells will be surveyed relative to x, y, and z coordinates. Horizontal coordinates (x and y) will be referenced to the Florida State Plane Coordinate System (North American Datum of 1983) and the vertical coordinate (z) will be referenced to the National Geodetic Vertical Datum (NGVD) system of 1929. The top-of-casing measurements, in conjunction with depth-to-water measurements, will be used to determine the local groundwater elevation and direction of groundwater flow.

Rising head "slug" test will be completed in each of the newly installed monitoring wells to obtain estimated values of aquifer hydraulic conductivity. To complete the "slug" test, a weighted PVC slug will be lowered into the well displacing a known volume of water. Following the water level's return to equilibrium, the slug will quickly be removed and a Hermit 1000 C data logger equipped with a pressure transducer will record the changes in water level over time.

2.7 ELECTROFISHING INVESTIGATION. The electrofishing investigation at NAS Jacksonville will be conducted by subcontract personnel at three separate water bodies: Lake Casa Linda, Lake Scotlis, and the polishing pond at OU2. At three random locations within each surface water body, a composite sample of at fish from each of the three trophic levels (omnivore, pisciferous, and foraging) will be collected using electrofishing methods. Adequate fish from each age and/or size group within each trophic level will be collected to yield the minimum required 300 grams of fillet and 300 grams of liver/gonad materials for each species. The separating of samples into appropriate trophic level, species, and age/size groups will be completed in the field. At each sample location, a total of 9 composite samples will be collected, including:

- three omnivore species within one age/size group,
- three pisciferous species within one age/size group, and
- three foraging species within one age/size group.

Samples will be hard frozen and placed in zip-loc bags prior to placement in ABB-ES shipping containers. The samples will be kept on ice and shipped in overnight carrier to a subcontract laboratory. Upon arrival at the subcontract laboratory, each individual fish sample will be dissected into separate meat fillet and liver/gonad samples. Samples will be analyzed for TCL SVOCs, TCL pesticides and PCBs, and TAL inorganics, including cyanide. Tables 2-1 and 2-2 provide a summary of the samples to be collected and the analytical methods to be completed. Analytical findings will be reported and validated in accordance with NEESA Level C requirements.

2.8 SURFACE WATER AND SEDIMENT SAMPLING. In conjunction with and support of the electrofishing activities a total of nine surface water and nine sediment samples will be collected from the three water bodies (Lake Casa Linda, Lake Scotlis, and the polishing pond at OU2) in which electrofishing activities occur. The surface water and sediment samples will be collected from the same locations where the electroshocking of fish occurred. All surface water and sediment samples will be collected in accordance with the USEPA Standard Operating Procedures and Quality Assurance Manual (February 1, 1991).

Surface water and sediment samples will be analyzed for TCL VOC, TCL SVOCs, TCL pesticides and PCBs, and TAL inorganics, including cyanide. Tables 2-1 and 2-2 provide a summary of the number of samples and the analytical methods to be completed. Surface water and sediment samples will be analyzed and reported in accordance with NEESA Level C DQOs.

3.0 INVESTIGATION DERIVED WASTE DISPOSAL

It is anticipated that hazardous wastes derived from this work potentially may include soil from the borings, groundwater, equipment decontamination rinsate water, disposable clothing, and gloves that come in contact with contaminated soil or water. Auger cuttings and purge water from the P-159 and UST sites will be separately containerized onsite and delivered to the Navy's temporary hazardous waste storage facility within the NADEP. Similarly disposable clothing and potentially contaminated gloves will be collected and containerized onsite and delivered to the same area. Equipment rinsate will be collected at the OU1 decontamination area and disposed of in accordance with Volume 5 RI/FS Work Plan on OU1, Section 5.15, Disposal of Investigation-Derived Wash.

4.0 HEALTH AND SAFETY

Health and safety protocols will be conducted in accordance with the approved Health and Safety Plan located in Appendix 1.5 of Volume I of the OU1 Work Plan, as modified by the ABB-ES health and safety officer. In summary, the following approach will be taken. Level D personal protection equipment (PPE) with organic vapor and vinyl chloride monitoring will be followed during drilling and sample collection. Dust masks will be worn if visible dust hazards are observed. If organic vapor or vinyl chloride concentrations over 1 part per million (ppm) above background readings are measured in the breathing zone, onsite personnel will withdraw to the designated transition area and reassess site conditions. If the organic vapor monitoring levels remain over 1 ppm above background and it is confirmed that they are not attributable to a malfunction of the monitoring equipment, PPE will be upgraded to Level C using Air Purifying Respirators (APRs). If vinyl chloride concentrations are reported to exceed 2 ppm at any time, PPE will be upgraded to Level B using self-contained breathing apparatus.

5.0 SAMPLING EVENT REPORTS

ABB-ES will prepare four separate Sampling Event Reports (SERs) for technical review and comment by the Navy. Individual SERs will be completed for Sites P-159, UST, P-3 Pad, and the cumulative electrofishing, surface water, and sediment sampling activities.

Each SER will describe the implemented field program, provide a data quality assessment, and develop a contamination assessment that focuses on ARAR compliance (especially RCRA Status and required actions, if any), any precautions recommended for personnel protection and worker safety relative to chemical exposures, and any follow-up work that may be necessary if RCRA action is

required. Review by the Navy will consist of comments on the technical scope and basic structure of the documents.

The SER for electrofishing activities at Lake Casa Linda, Like Scotlis, and the polishing pond will evaluate the public health risks from consuming fish from these three water bodies. Validated data will be used to prepare the evaluation. The SER will contain a recommendation on whether recreational fishing should be allowed to continue at each of the lakes.

ABB-ES will respond to comments from the Navy's review of the draft document. These comments will be incorporated into the Final SER. Four copies of the Draft and Final versions will be provided to the Navy for distribution.

6.0 PROJECT SCHEDULE

The work at this site is anticipated to be completed in one 10-day and one 5-day period. Analytical work related to soil samples will be conducted on a "rapid turn-around" basis, and Form 1 data (non-validated, raw data) should be available for review within 14 days of delivery to the laboratory. Figure 6-1 presents the Gantt chart timeline schedule.

7.0 PROJECT PERSONNEL

The designated roles for the Installation Restoration work at NAS Jacksonville are as follows.

Senior Task Order Manager. The Senior Task Order Manager for NAS Jacksonville will be Philip Georgariou. Mr. Georgariou is responsible for the day-to-day conduct of the work, including the integration of the input of supporting disciplines and subcontractors. He will be reviewing the ongoing quality control during the performance of the work, the technical integrity of conclusions and recommendations, and the clarity and usefulness of all project work products.

Some specific responsibilities of this role include:

- initiating project activities;
- participating in the work plan preparation and staff assignments;
- identifying and fulfilling equipment and other resource requirements;
- monitoring task activities to ensure compliance with established budgets, schedules, and scope of work; and
- regularly interacting with the RPM, the program manager, and others as appropriate, on the status of the project.

Technical Leader. The Technical Leader for this effort will be Mr. Gerald Walker, P.G. Mr. Walker is responsible for evaluating the appropriateness and adequacy of the technical and engineering services provided for this CTO and in developing the technical approach and level of effort required to address each of the POA tasks.

Quality Review Board. A Quality Review Board made up of senior technical staff from the ABB-ES team will assist the Task Order Manager by providing review of the technical aspects of the project to assure that they are produced in accordance with regulatory and corporate policy, and meet the requirements of SOUTHNAVFACENGCOM.

ADDENDUM TO
P-159, UST, AND P-3 PAD
SAMPLING AND ANALYSIS PLAN

This Sampling and Analysis Plan (SAP) Addendum was completed based on discussions between the SOUTHNAVFACENGCOM Engineer-in-Charge and ABB-ES Project Manager for this project, during a meeting conducted on may 14, 1993. Modifications to the SAP are limited to Section 5.0 Sampling Event Reports. This section is modified as follows:

5.0 SAMPLING EVENT REPORTS

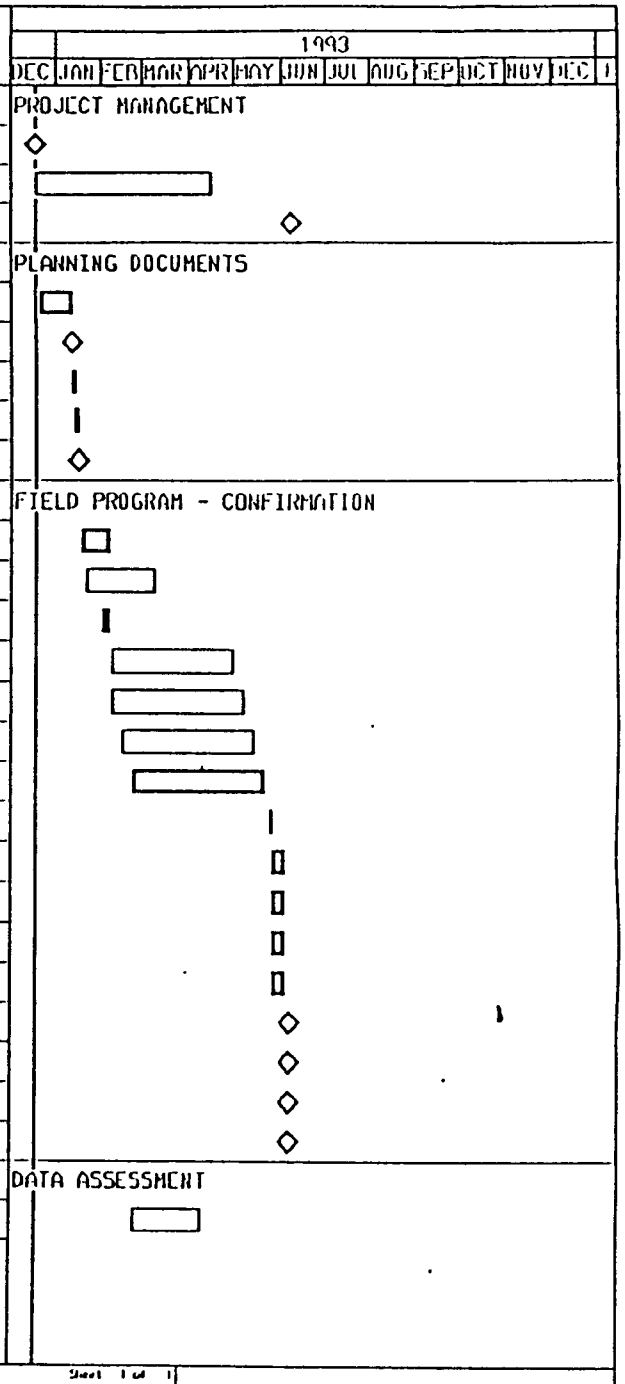
ABB-ES will prepare four separate Sampling Event Reports (SERs) for technical review and comment by the Navy. Individual SERs will be completed for Sites P-159, UST, P-3 Pad, and the cumulative electrofishing, surface water, and sediment sampling activities.

Each SER will describe the implemented field program, provide a data quality assessment, and develop a contamination assessment that focuses on ARAR compliance (especially RCRA Status and required actions, if any), any precautions recommended for personnel protection and worker safety relative to chemical exposures, and any follow-up work that may be necessary if RCRA action is required. Review by the Navy will consist of comments on the technical scope and basic structure of the documents.

The SER for electrofishing activities at Lake Casa Linda, Lake Scotlis, and the polishing pond will report and transmit data only. An evaluation of the public health risks from consuming fish and recommendations on recreational fishing from these three water bodies will not be completed.

ABB-ES will respond to comments from the Navy's review of the draft document. These comments will be incorporated into the Final SER. Four copies of the Draft and Final versions will be provided to the Navy for distribution.

ACTIVITY ID	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH	ORIG DUR
S10200000	CTO NO. 075 NOTICE TO PROCEED	18DEC92		0
S10200005	PROJECT MANAGEMENT	18DEC92	15APR93	83
S10200999	CTO NO. 075 COMPLETE		7JUN93	0
S10410005	PREPARE SAP/HASP	21DEC92	11JAN93	14
S10410015	SUBMIT HASP/SAP		11JAN93	0
S10410020	NAVY REVIEW DRAFT HASP/SAP	12JAN93	13JAN93	2
S10410025	PREPARE FINAL HASP/SAP	13JAN93	15JAN93	3
S10410030	SUBMIT FINAL HASP/SAP		15JAN93	0
S10800005	FIELD WORK (DRILLING/ELECTROFISHING)	18JAN93	5FEB93	15
S10835005	SAMPLE ANALYSIS	21JAN93	8MAR93	33
S10815005	SURVEYING	1FEB93	5FEB93	5
S10865005	PREPARE DRAFT SAMPLING EVENT REPORT (SER) - P159	8FEB93	30APR93	60
S10865105	PREPARE DRAFT SAMPLING EVENT REPORT (SER) - UST	8FEB93	7MAY93	65
S10865205	PREPARE DRAFT SAMPLING EVENT REPORT - P-3 SOIL	15FEB93	14MAY93	65
S10865305	PREPARE DRAFT SER - ELECTROFISHING	22FEB93	21MAY93	65
S10865000	SAMPLING EVENT REPORT REVIEW MEETING	25MAY93	26MAY93	2
S10865010	PREPARE FINAL SAMPLING EVENT REPORT - P159	27MAY93	4JUN93	6
S10865110	PREPARE FINAL SAMPLING EVENT REPORT - UST	27MAY93	4JUN93	6
S10865210	PREPARE FINAL SAMPLING EVENT REPORT - P-3 SOIL	27MAY93	4JUN93	6
S10865310	PREPARE FINAL SER - ELECTROFISHING	27MAY93	4JUN93	6
S10865015	SUBMIT FINAL SAMPLING EVENT REPORT - P159		7JUN93	0
S10865115	SUBMIT FINAL SAMPLING EVENT REPORT - UST		7JUN93	0
S10865215	SUBMIT FINAL SER - P-3 SOIL PILES		7JUN93	0
S10865315	SUBMIT FINAL SER - ELECTROFISHING		7JUN93	0
S11005005	DATA VALIDATION	23FEB93	9APR93	34



Plot Date 4JUN93
Data Date 18DEC92
Project Start 18DEC92
Project Finish 7JUN93

(c) Primavera Systems, Inc

Activity Bar/Early Date
Critical Activity
Progress Bar
Milestone/Key Activity

NAVY CLEAN
CTO NO 075
BASELINE PROJECT SCHEDULE

Date | Revision | Checked | Approved

APPENDIX B

ELECTROSHOCKING FISHERIES INVESTIGATION IN THREE WATER BODIES ON NAVAL AIR STATION, JACKSONVILLE, FLORIDA

FINAL REPORT ON AN ELECTROSHOCKING FISHERIES INVESTIGATION IN THREE WATER BODIES ON NAVAL AIR STATION, JACKSONVILLE, FLORIDA

PREPARED FOR:

ABB-ENVIRONMENTAL SERVICES

PREPARED BY:

ECT

Environmental Consulting & Technology, Inc.

5405 Cypress Center Drive
Suite 200
Tampa, Florida 33609
(813) 289-9338

93049-0100

MARCH 1993

INTRODUCTION

Environmental Consulting & Technology, Inc. (ECT) was contracted to collect fisheries specimens from within three separate water bodies on the property of Naval Air Station (NAS) Jacksonville. Casa Linda Lake designated as surface water station 1 (SW-1, see Figure 1), Lake Scotlis designated as SW-2, and a lagoon system referred to as the Polishing Pond designated SW-3. Fisheries sampling was performed to obtain tissue samples for laboratory analysis to detect the presence of contaminants. Specimens were to be obtained from within three separate trophic levels representing the top-predator piscivores, the middle level omnivores and the lower level foraging species which feed primarily upon phytoplankton, vegetation or detritus. The total sample size per species group was to equal or exceed 600 grams (gms) from each water body. Electroshocking was the principal methodology for sample collection, augmented as necessary utilizing dipnets and seines. The physical characteristics of each water body were evaluated concurrent with fisheries sample collection.

METHODOLOGY

For fisheries sample collection ECT utilized an aluminum hulled "Jon-boat" equipped with a Honda 240 volt generator and a Smith-Root® Electrofisher. For fisheries population surveys and small-size sample collection, ECT utilizes direct current (DC) voltage. The reaction of fish to direct current is to turn and swim toward the anode (extended copper probes), a reaction referred to as galvanotaxis (Smith-Root, Inc.). Eventually the fish becomes incapable of further forward movement and turns on its side, a reaction known as galvanonarcosis. Larger fish (within a species group) are stunned at a greater distance from the field than small fish, since the effect increases proportionally with surface area. Small fish often reach, or nearly reach the anode prior to experiencing galvanonarcosis. Differences between species are related to the conductivity of the fish being compared. Electrofishing current will most greatly affect fish with conductivities at or above the ambient conductivity. Aquatic species

which have conductivity values well below the ambient value can be missed as the current selectively travels through the more conductive water (Smith-Root, Inc.). However, species adapted to freshwater habitat almost always have much greater solute concentrations (and thus conductivity) than their environment, to the extent that energy is expended in either active salt uptake or excessive urination (Hainsworth, 1981). A rare exception to this rule occurs in the lamellibranch species Anodontia, a freshwater bivalve (Potts and Parry, 1963). In addition to the previously mentioned enhanced susceptibility of larger specimens, ECT personnel have observed that species which typically inhabit the lower end of the water column (e.g., gars, catfish, and carp) are the most greatly affected by any given field. These observations have been confirmed in conversation with other experienced electrofishers. This may be due to a higher natural density per unit volume (and thus conductivity) associated with bottom dwelling.

The physical characteristics of the water bodies were measured with a Hydrolab® Surveyor II which was calibrated each morning before sampling.

Prior to obtaining the requisite specimens, electrofishing was conducted in each water body to determine the most productive locations and to select the appropriate species to represent the respective trophic levels. Once collected, specimens were identified to the level of genus and species, wrapped whole in aluminum foil, placed in labelled Ziploc® bags, and then stored on dry ice. Once hard-frozen, the fish samples were transferred to coolers containing wet ice for transport to a laboratory facility within 24 hours of collection.

RESULTS

Casa Linda Lake

Casa Linda Lake (SW-1) is an approximately 8.9 acre lake with highly altered shorelines, receiving drainage from surrounding golf course, multi-family residential,

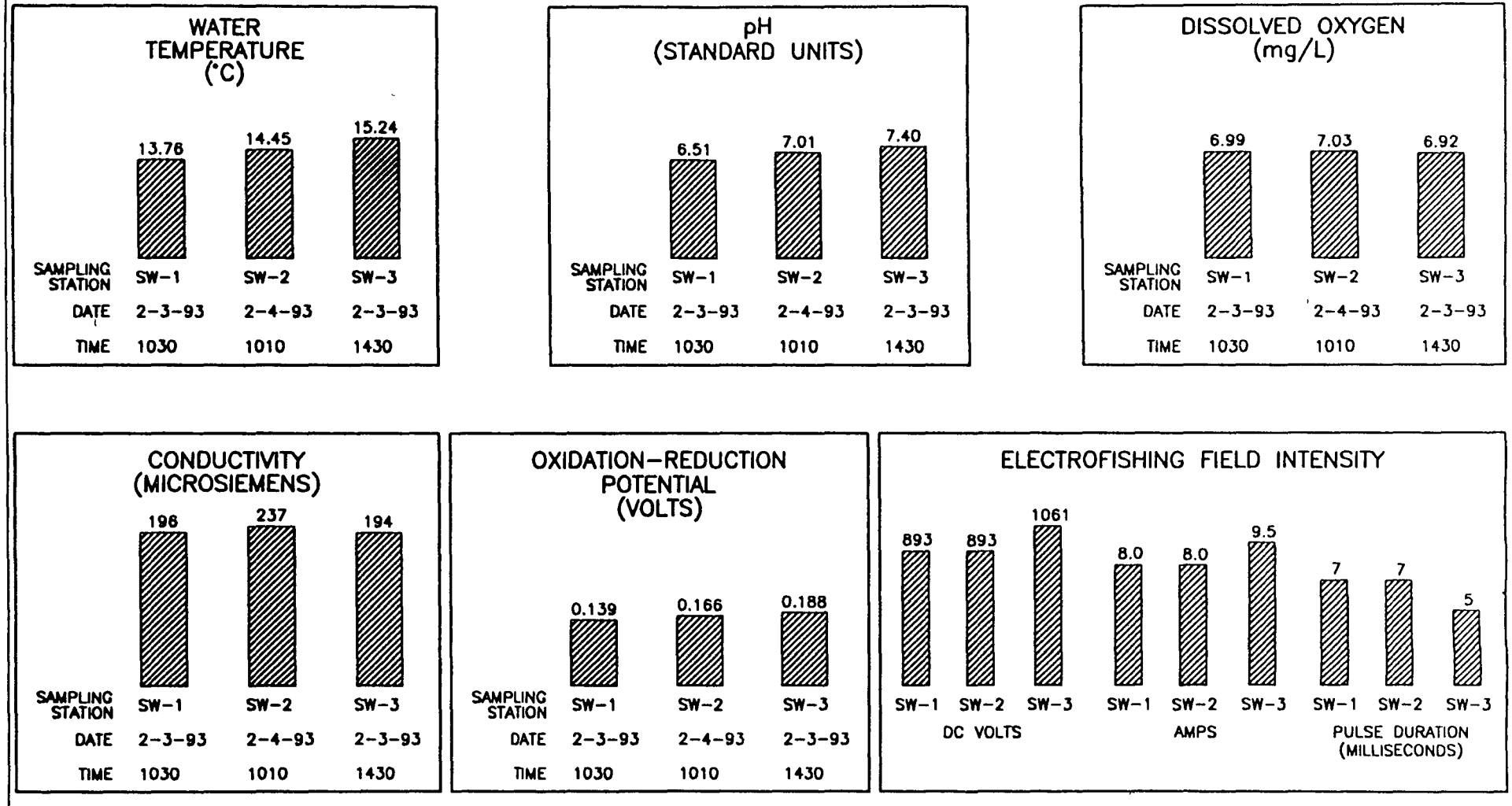


FIGURE 2
PHYSICAL CHARACTERISTICS OF THE WATER IN CASA LINDA LAKE (SW-1), LAKE SCOTLIS (SW-2) AND THE POLISHING POND (SW-3)
NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA
Source: ECT, 1993.

ECT
Environmental Consulting & Technology, Inc

Table 1. Fish Species and Approximate Size Ranges for Samples Collected From Three Water Bodies on Naval Air Station, Jacksonville, Florida

	Foraging Species	Size Range	Omnivorous Species	Size Range	Piscivorous Species	Size Range
Casa Linda Lake (SW-1)	Golden Shiner *Notemigonus crysoleucas*	<5 cm	Bluegill *Lepomis macrochirus*	6 to 12 cm	Largemouth Bass *Micropterus salmoides*	<24 cm
Lake Scotlis (SW-2)	Gizzard Shad *Dorosoma cepedianum*	20 cm	Bluegill *Lepomis macrochirus*	6 cm	Largemouth Bass *Micropterus salmoides*	12 to 18 cm
Polishing Pond (SW-3)	None Collected	N/A	None Collected	N/A	None Collected	N/A

Source: ECT, February 1993.

Polishing Pond

The Polishing Pond (SW-3) is a medium sized (approximately 3.8 acre) meandering lagoon which receives drainage from flatwoods, maintained grassy fields near the flightline, and formerly through an outfall from a wastewater treatment system. The lagoon discharges to a treatment facility at its northwestern end, with an approximately 1,000 ft path length from the pipe at the former wastewater treatment outfall. Upon reaching the end of the lagoon's treatment facility, water discharges to the St. John's River. Vegetation within the lagoon is sodded bank to the shoreline, with a sparse emergent zone of sedges and pennywort. There are occasional shrubby emergents within the lagoons including Carolina willow and the stems of apparently dead shrubs that may be over-wintering or herbicided primrose willow (Ludwigia sp.).

The physical characteristics of the Polishing Poind during sampling were evaluated on February 3, 1993, with measurements taken at approximately 2 ft of depth (see Figure 2).

An abundant aquatic avifauna utilizes the lagoon system, primarily concentrated in the north-central portion near a small stand of Carolina willow. Observed species include the great egret (Casmerodius albus) and white ibis (Eudocimus albus) roosting in the shrubs, as well as laughing gulls (Larus atricilla) and ring-billed gulls (Larus delawarenis) paddling on the surface of the lagoon. Also abundant throughout the lagoon are nutrias (Myocastor coypus), which could be observed swimming and foraging along the banks. These mammals were introduced to North America for the fur trade, but have escaped and become naturalized throughout the southeast.

No fish species were observed within the Polishing Pond. The shoreline was walked with a dipnet and no small minnows of any sort were observed in the shallow grassy

The apparent absence of any fishery in the Polishing Pond is not surprising given the obvious unnatural shape, origin, and function of the system. However, it is extremely unusual for a water body that has existed for a long time (as the Polishing Pond presumably has), to have no fish species of any sort observed. The Polishing Pond supports some vegetation and provides habitat for birds and mammals which associate closely with the lagoon. However, neither the birds nor the mammals are entirely aquatic. Entirely aquatic invertebrates (e.g., creeping waterbug, Ambrysus femoratus) were observed swimming in the lagoon. In the absence of specific sediment and surface water quality data no conclusions can be reached which may explain the apparent absence of any fisheries.

During the collection of samples from Casa Linda Lake and Lake Scotlis, fish specimens were observed to have skin lesions. These lesions were observed in various locations on the body, although they were most frequently found on the lateral or ventral surfaces. Lesions were observed most frequently on the omnivores and piscivores; this is most likely because omnivore and piscivores were the most frequently encountered species. Lesions were more frequently observed on fish collected from Casa Linda Lake than they were on those from Lake Scotlis.

A review of the literature available on fisheries pathology suggests that the lesions are a manifestation of Ulcerative Disease Syndrome (UDS). The most likely causative agent is the bacterium Aeromonas hydrophila. This bacterium appears in the blood of both diseased and undiseased fish, and may be a normal part of the fish's flora (McGarey, 1991). Numerous causative agents may be implicated in UDS, including nematodes, fungi, and Vibrio viruses. However, in low salinity or freshwaters the density of Aeromonas hydrophila is greatest (Hazen J.C., *et al.* 1978). The related bacterium Aeromonas sobria also occurs in freshwater and also has been documented as causing UDS at a control temperature of 30 degrees Celsius (°C). However, at lower temperatures (down to 10°C), only Aeromonas hydrophila

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